

UNION SWITCH & SIGNAL 

1000 TECHNOLOGY DRIVE,
PITTSBURGH, PA 15219-3120

SM6468

Field Maintenance

PD-1 STYLE VITAL PLUG-IN RELAYS

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REVISION INDEX

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SECTION I

GENERAL INFORMATION

1.1 INTRODUCTION

This service manual contains field maintenance data for PD-1 Vital Relays (Figure 1-1). The purpose of the manual is to provide signal maintenance personnel with the data needed to understand PD-1 relay operation and how to perform field maintenance inspection and testing of the relays.

Vital relay scheduled maintenance consists of periodic inspections and tests. The inspections and tests verify the relays are performing within the minimum In-Service Application Limits as specified on the Application Information Sheets for the relays. These sheets are contained in the Appendix at the rear of this manual. Relays not meeting the In-Service Application Limits must be replaced. Relays removed from service must be shopped for further testing and repair.

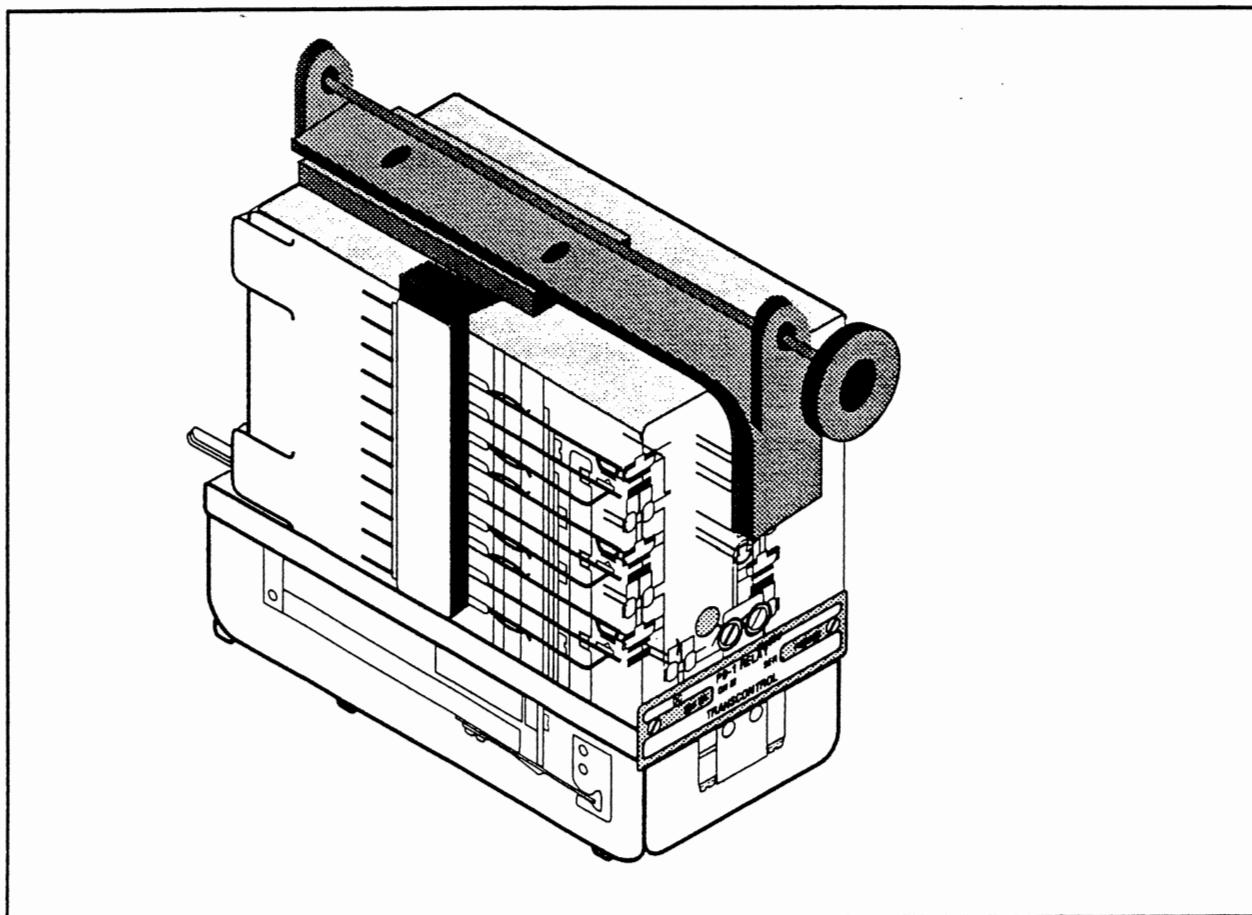


Figure 1-1. PD-1 Vital Relay, With Mounting Bracket

1.2 GENERAL DESCRIPTION

The PD-1 vital relays described in this manual are dc vital relays of the following types:

- a. Biased Neutral, including the following :
 - 1. Ordinary Acting with Low Voltage contacts
 - 2. Ordinary Acting with High Voltage contacts
 - 3. Slow Release and Slow Pickup
 - 4. Ordinary Acting with Magnetic Blowout contacts
 - 5. Light Out
- b. Magnetic Stick
- c. Switch Overload Stick
- d. Flasher

All PD-1 Vital Relay types are plug-in relays designed for railroad and transit signal applications and manufactured to meet AAR requirements for vital signal relays

1.3 PD-1 RELAY PRODUCT FEATURES

Each PD-1 Vital Relay possesses the following product features:

- a. Mounting with either rear or front-service plug couplers.
- b. Wire connectors with commercially available plug connectors (Faston) for easy wiring.
- c. Wide selection of coil resistance and contact configurations
- d. Contact protection by a transparent dust cover for visual inspection.
- e. Contacts that can be easily replaced when necessary.
- f. Relay that locks securely in its working position.
- g. Coded index pins to assure correct relay-type insertion.
- h. Test point accessible from the front of the relay.
- i. Plug coupler that accepts two plug connectors per contact point.

1.4 PD-1 RELAY MOUNTING OPTIONS

PD-1 relays satisfy the special needs of vital circuits in railroad and transit signal systems. PD-1 plug couplers are available for both front and rear service. This enables the PD-1 relays to be mounted in relay racks where rear service is possible, or on a wall or shelf where front service is necessary. For shelf mounting, a support bracket is combined with a front service plug coupler. All wires are terminated on the plug coupler by removable solderless plug connectors. The plug connectors are available with or without a locking feature.

1.5 MAGNETIC CIRCUIT

Magnetic circuits are constructed of non-aging material. The magnetic air gap is not disturbed when the coil or contacts are removed

1.6 CONTACTS

Contact fingers and springs are manufactured of spring-tempered phosphore bronze. Individual contacts are removable and easily replaced. Movement of the armature operates the heel spring and assures proper contact wiping. Plug connectors are tin-plated. Contact material for low voltage front contacts is silver carbon. Heel and back contacts are made from fine silver. Heavy duty contacts are silver-to-silver.

1.7 COVER

A cover of transparent molded non-yellowing material houses the relay contacts and armature structure. The cover is sealed to its frame by pressure against a gasket, providing a tight dust-proof moisture-protected assembly.

1.8 FRONT TEST POINT

This testing facility is in series with the coil control circuit to permit deenergization of the relay while in service without disturbing the relay or wiring. The test point permits measuring of the relay coil current by insertion of a PD-1 current test probe.

1.9 RELAY VOLTAGE

PD-1 relays are manufactured for different input or control voltages. For specific voltage values refer to the relay's Application Information Sheet contained in the Appendix at the rear of this manual. Higher voltages can be used, but the maximum dissipating power of the coil should not exceed 10W.

1.10 PLUG COUPLER

Plug couplers must be ordered separately. As stated, two types of plug couplers are available: rear service and front service (Figure 1-2).

1.10.1 Rear Service Plug Coupler

Rear service plug couplers are permanently mounted onto a relay rack. The wires are attached to the plug coupler with plug connectors from the rear.

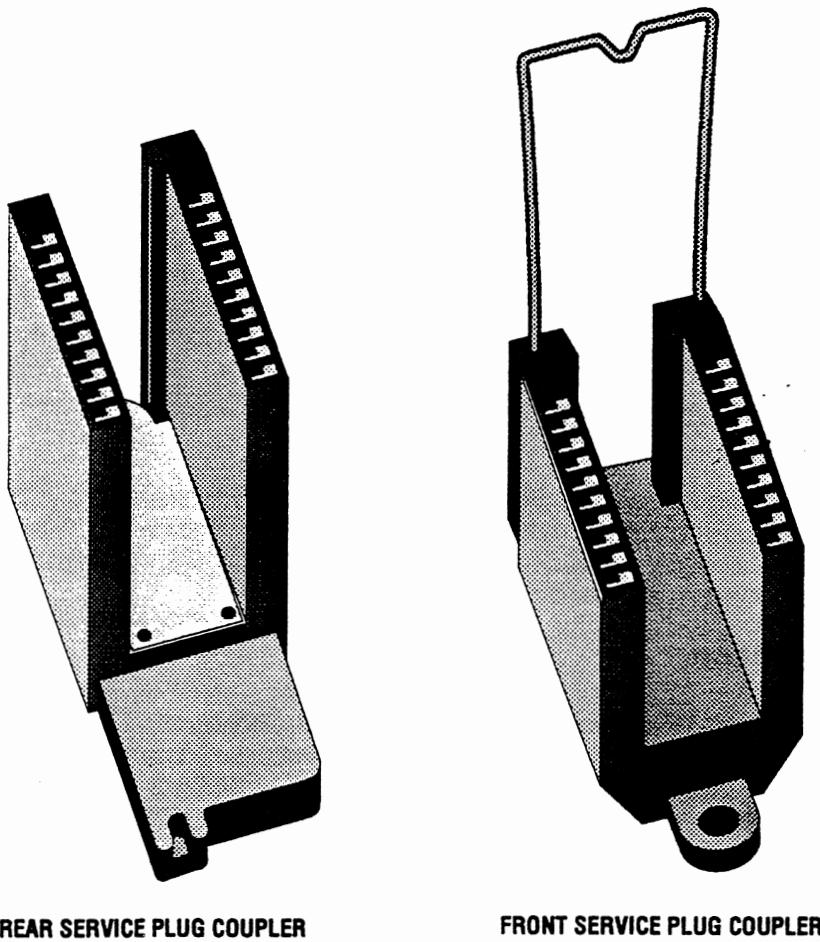


Figure 1-2. PD-1 Plug Couplers

1.10.2 Front Service Plug Coupler

The PD-1 Relay with a front service plug coupler (Figure 1-3) is supported by two rods. These rods are secured to the shelf or wall. When in its working position, the relay is secured by two nuts. For service, the two nuts are removed and the relay is pulled forward on the support rods until the plug coupler contacts are accessible. The design offers maximum space utilization, since relays can be mounted on a wall or on both sides of a relay rack

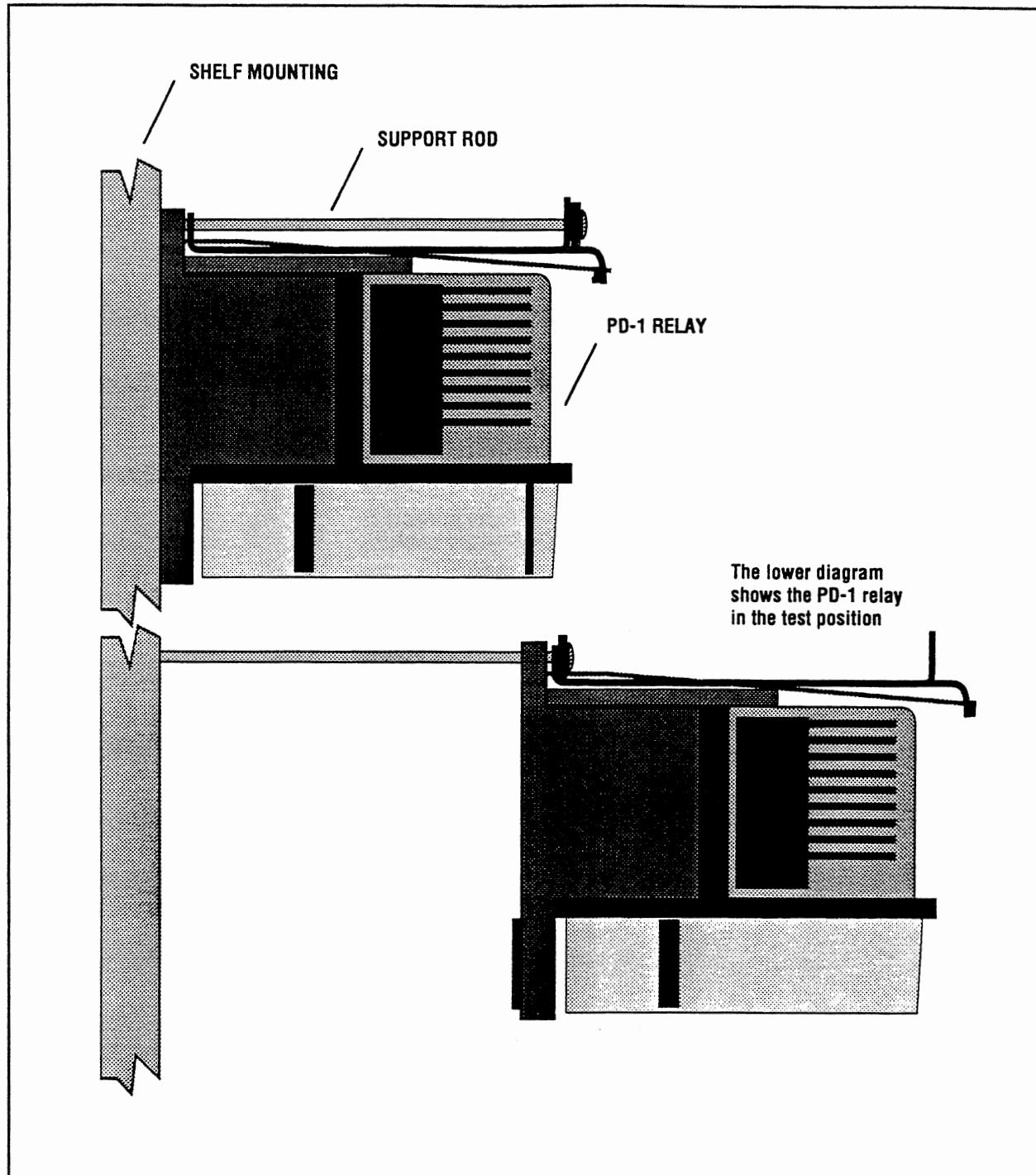


Figure 1-3. PD-1 Front Service Plug Couplers

1.11 INDEXING

PD-1 vital relays and plug couplers are supplied with indexing (Figure 1-4). A code plate, unique to the relay, is furnished with the relay independent of type-of plug coupler for rear service (B, Figure 1-2).

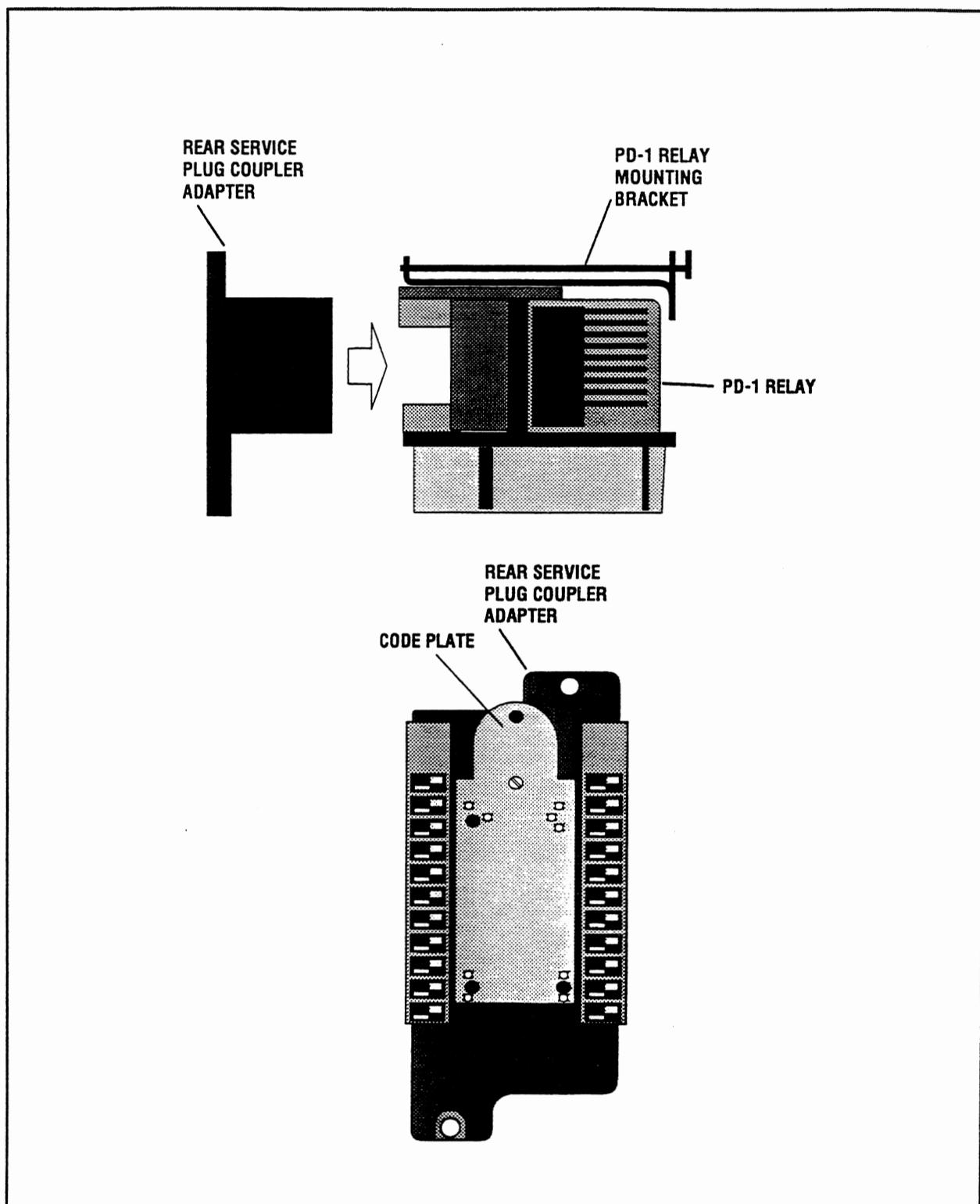


Figure 1-4. Rear Service Plug Coupler Indexing

1.12 TERMINATION

Plug coupler wire contacts can be terminated by solder connection or by plug (Faston) connectors with or without a locking feature (Figure 1-5). The solderless connectors with insulated sleeves are normally used.

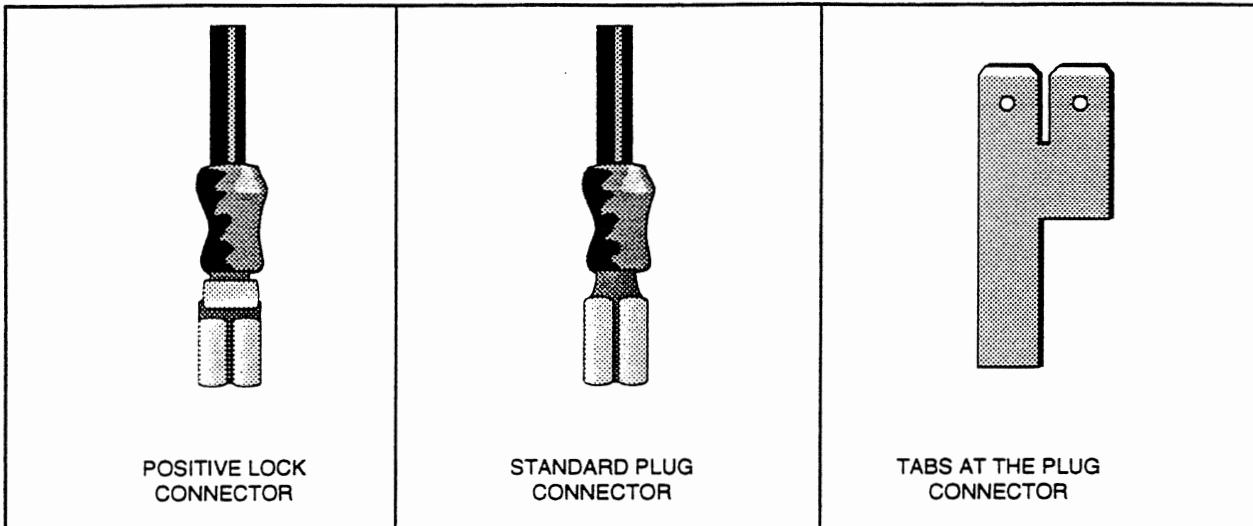


Figure 1-5. Plug Connectors and Plug Coupler Tabs

1.13. TERMINATION NOMENCLATURE

Rear service plug couplers are marked with nomenclature as shown in Figure 1-6. Plug couplers are equipped with 20 (2x10) double blade contacts (Tabs at the Plug Coupler, Figure 1-5) for easy termination.

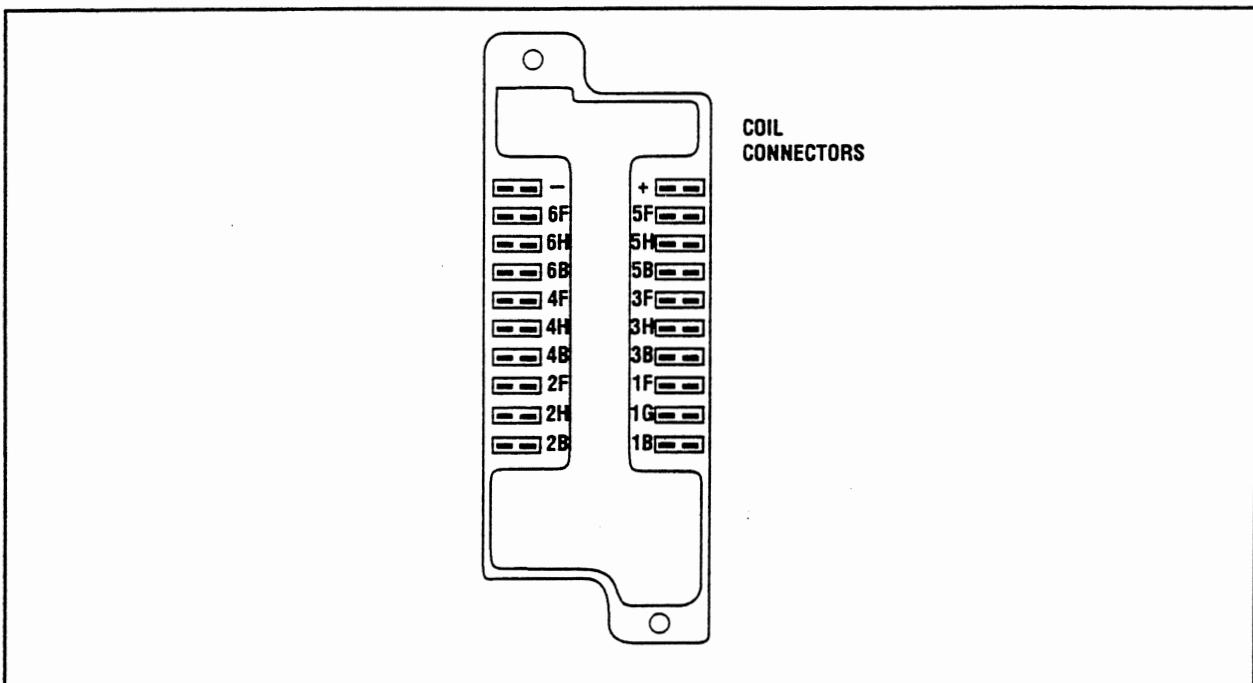


Figure 1-6. Rear Service Plug Coupler Nomenclature

1.14 PLUG COUPLER MOUNTING ARRANGEMENTS**1.14.1 Rack Mounting**

PD-1 relays are secured in their plug couplers and can be easily removed. Plug couplers are mounted onto relay racks in signal cases central instrument houses, and relay rooms. Typical mounting arrangements are shown in Figures 1-7 and 1-8.

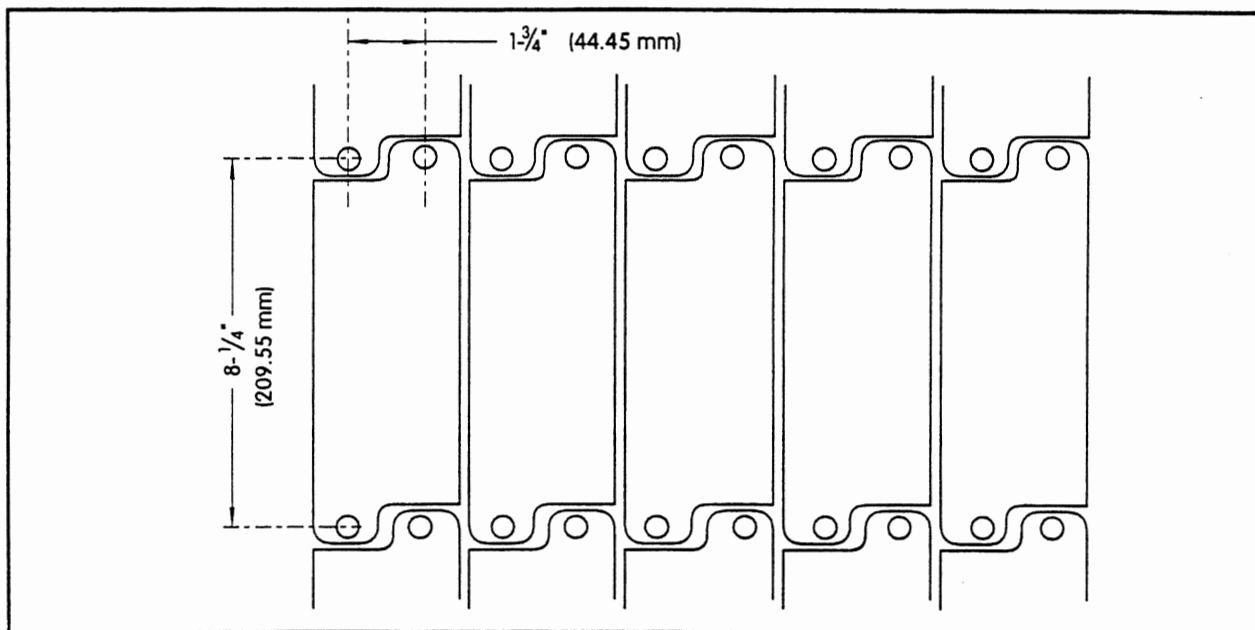


Figure 1-7. Rear Service Plug Couplers, Typical Mounting

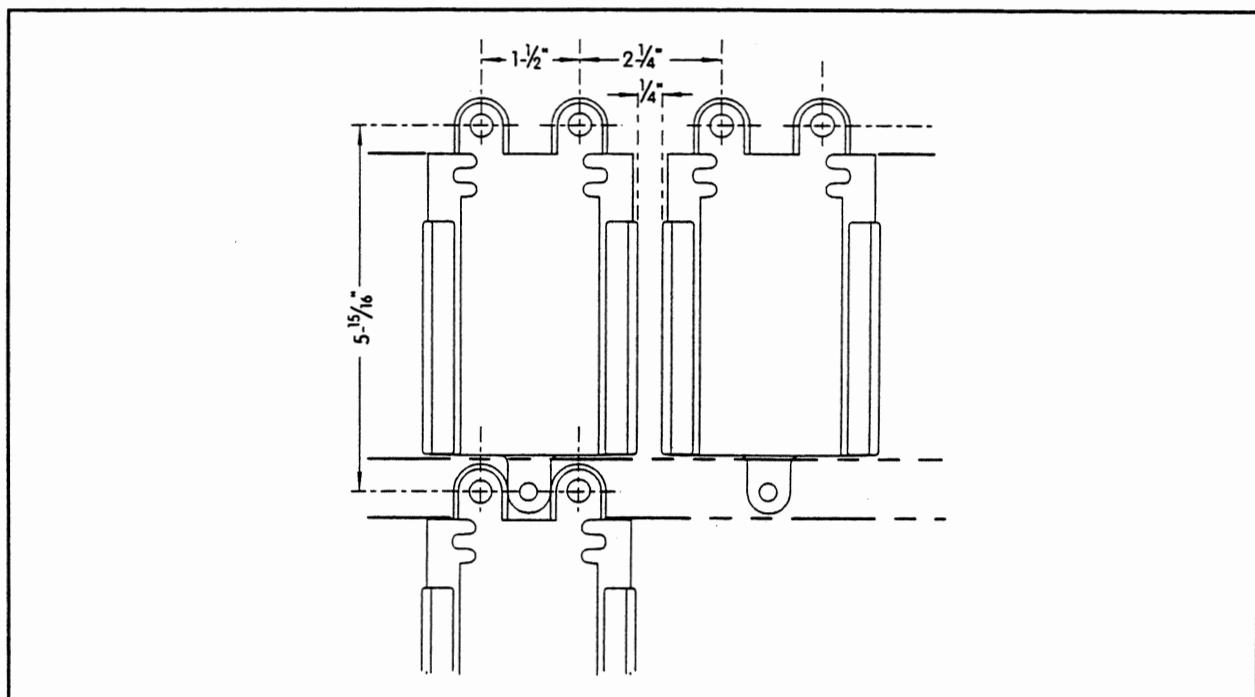


Figure 1-8. Front Service Plug Coupler, Typical Mounting

1.14.2 Shelf Mounting

For wall and shelf mounting of PD-1 relays, a shock mounting base is available. For such mounting arrangements, a front service plug coupler must be used, or the wires can be connected directly to the relay terminals with plug connectors.

1.15 TOOLS AND ACCESSORIES

A broad range of tools and accessories are available, including test plugs, plug connectors, crimping tools, etc. Also available is a relay test stand. The relay test stand facilitates testing of individual dc relays out of the relay racks. The relay test stand is sufficiently portable for use in the field or in the shop.

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SECTION II

FUNCTIONAL DESCRIPTION

2.1 INTRODUCTION

This section contains functional descriptions of each type of PD-1 vital relay. Description of general operation of the relays is presented first. This is followed by brief descriptions of specific relay types.

2.2 DC VITAL RELAY GENERAL OPERATION

Figure 2-1 illustrates the structure of a typical dc vital relay. The arrangement shown in Figure 2-1 is a simplified drawing of a vital relay. Figure 2-2 illustrates the PD-1 style of vital relay. The major difference between the two illustrations is the location of the relay's coil and armature.

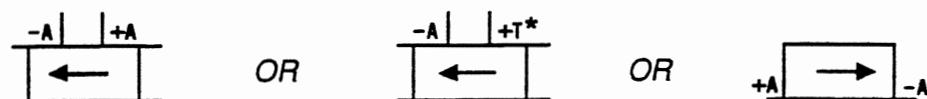
The PD-1 style of vital relay has its coil mounted vertically in the rear of the relay structure and its armature installed on the bottom of the relay structure, as shown in Figure 2-2. The electrical and magnetic operation of most styles of vital relays is the same.

2.3 DC BIASED VITAL RELAYS

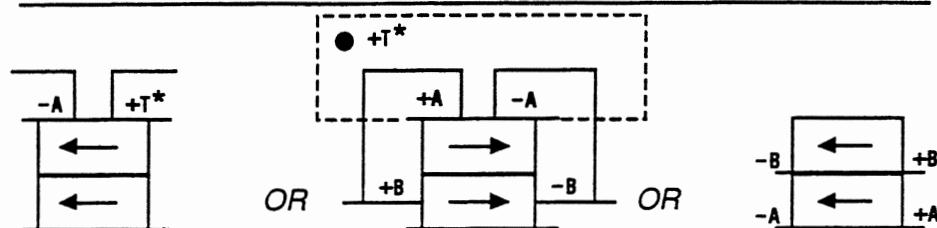
A biased relay is equipped with a permanent magnet and arranged so that the relay armature picks up only when dc current is flowing in the coil in a prescribed direction.

The AAR defines a biased relay as: "A relay that will operate to its energized position by current of one polarity only, and will return to its deenergized position when current is removed ". The schematic symbol for the biased relay is:

SINGLE COIL



DOUBLE COIL



* "T" IS A FRONT TESTING CONTACT WHICH IS INTERNALLY WIRED IN SERIES WITH +A

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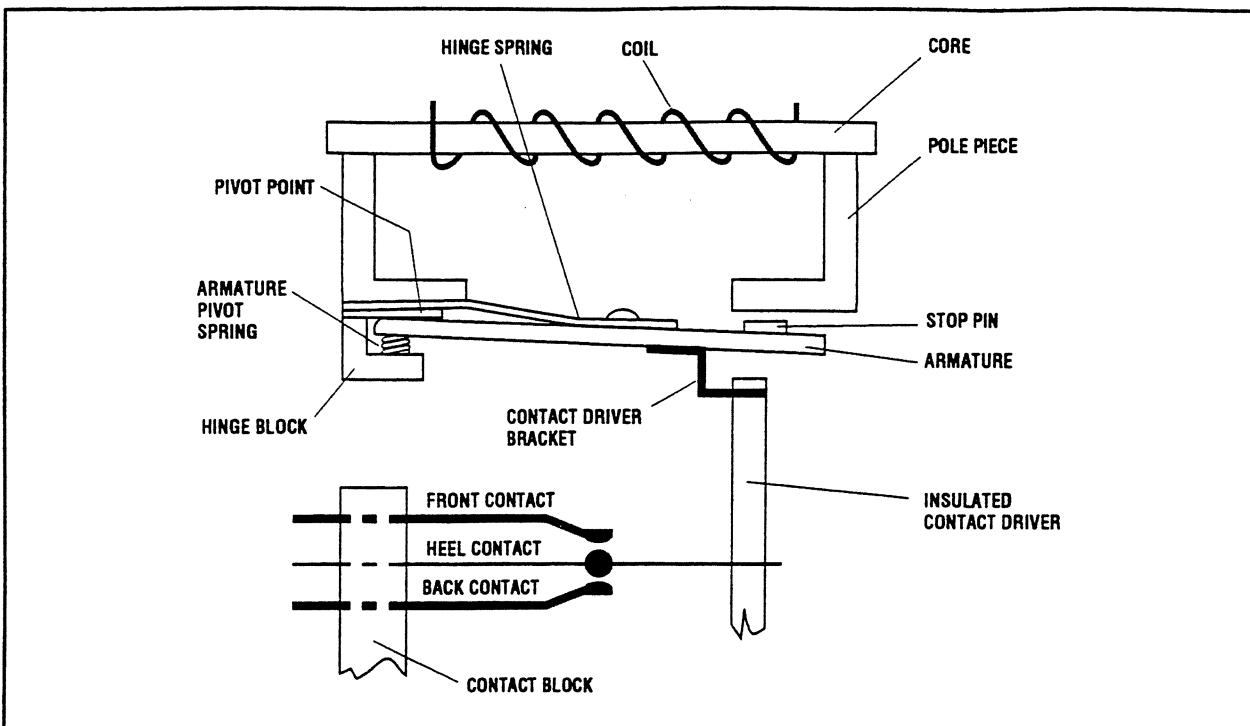


Figure 2-1. Simplified Vital Relay Arrangement

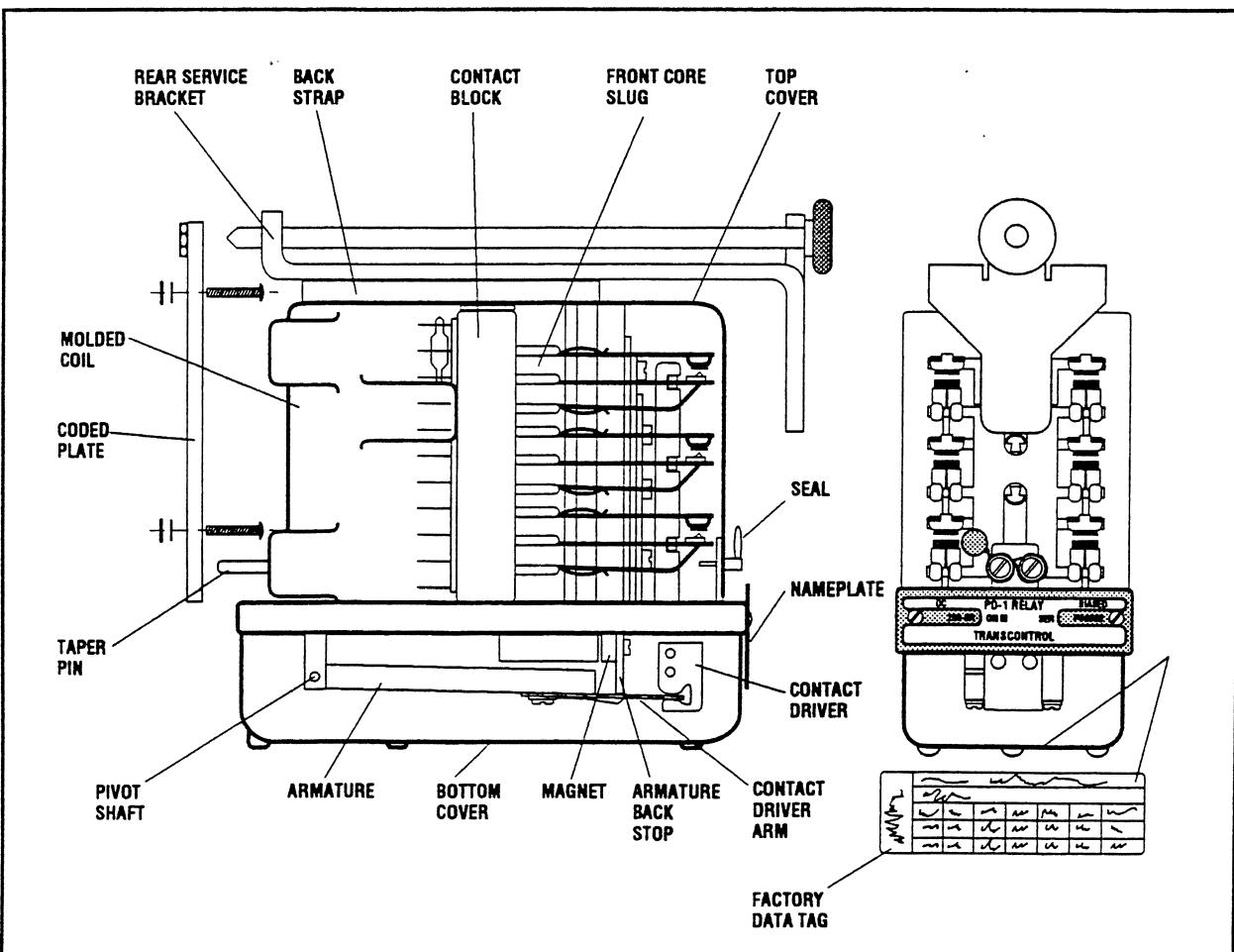


Figure 2-2. PD-1 Relay Arrangement

NOTE

The illustrations in Figures 2-3 through 2-5 are functionally applicable to all styles of vital relays. Remember, however, the physical arrangements can be different.

With no current passing through the coil, the permanent magnet is positioned so that its magnetic flux passes through the armature, permanent magnet, pole pieces, and core, as shown in Figure 2-3. This condition holds the armature in the deenergized or dropped position. The high reluctance (magnetic resistance) of the air gap prevents magnetic flux from flowing between the armature and the pole piece extension.

Assume that current is applied to the coil circuit, and current flow through the coil is in the direction in which its magnetism opposes the magnetism of the permanent magnet, as shown in Figure 2-4. This condition is comparable to a high reluctance in the path of the permanent magnet flux. The resulting magnetic flux path is through the core, pole piece, pole piece extension, and the armature. As a result, the relay is energized with the armature in the energized or picked position.

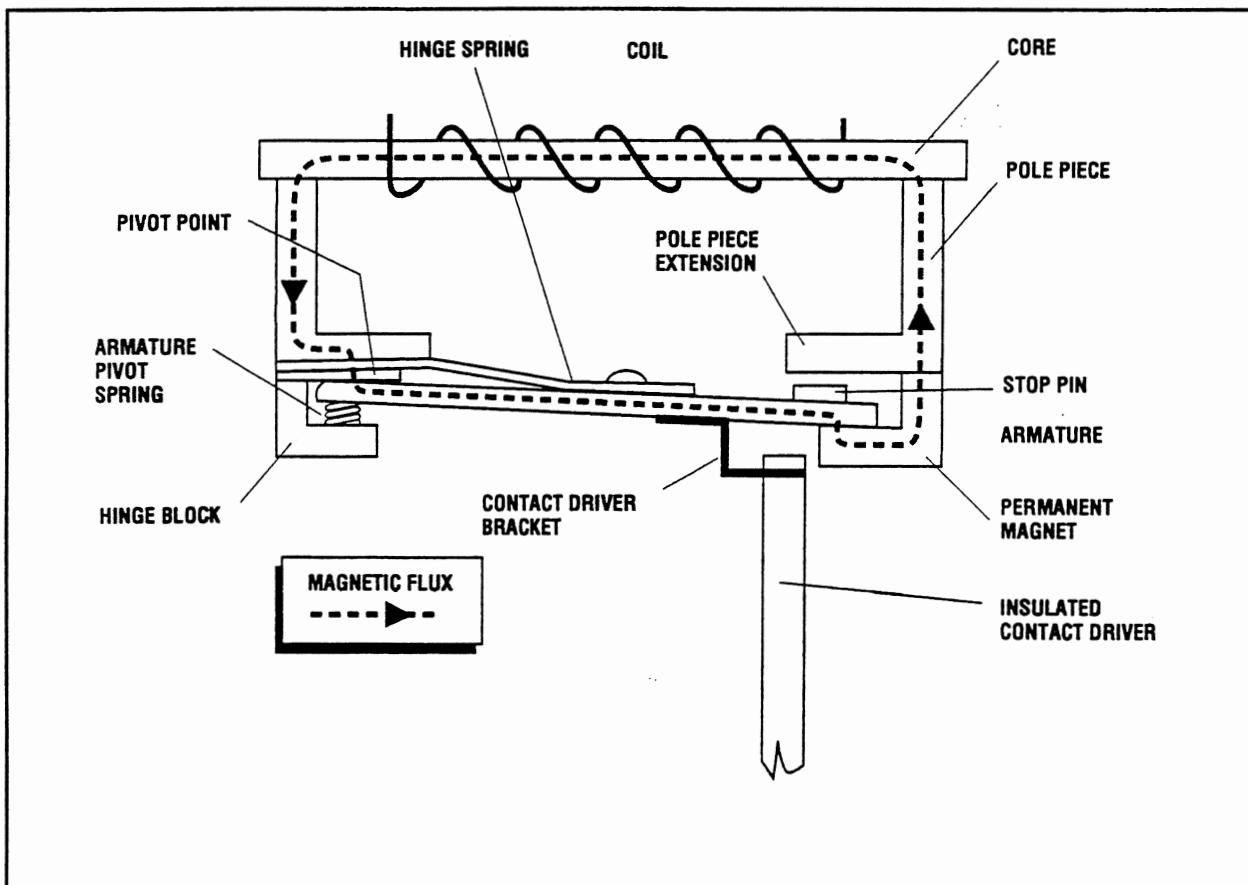


Figure 2-3. Biased Relay, No Voltage Applied

The armature remains up as long as the coil is energized. When the coil circuit is opened, the magnetic force opposing the permanent magnet is destroyed. Once more, the flux of the permanent magnet resumes the low reluctance path through the pole piece and armature. Since there is no force to hold the armature up, it drops away from the pole pieces.

Assume voltage of the opposite (reverse) polarity is applied to the coil (Figure 2-5). This creates a magnetic force, which aids the magnetic force of the permanent magnet, and the flux remains through the permanent magnet, armature, and pole pieces. Thus, with voltage of the opposite polarity, the armature is not picked up.

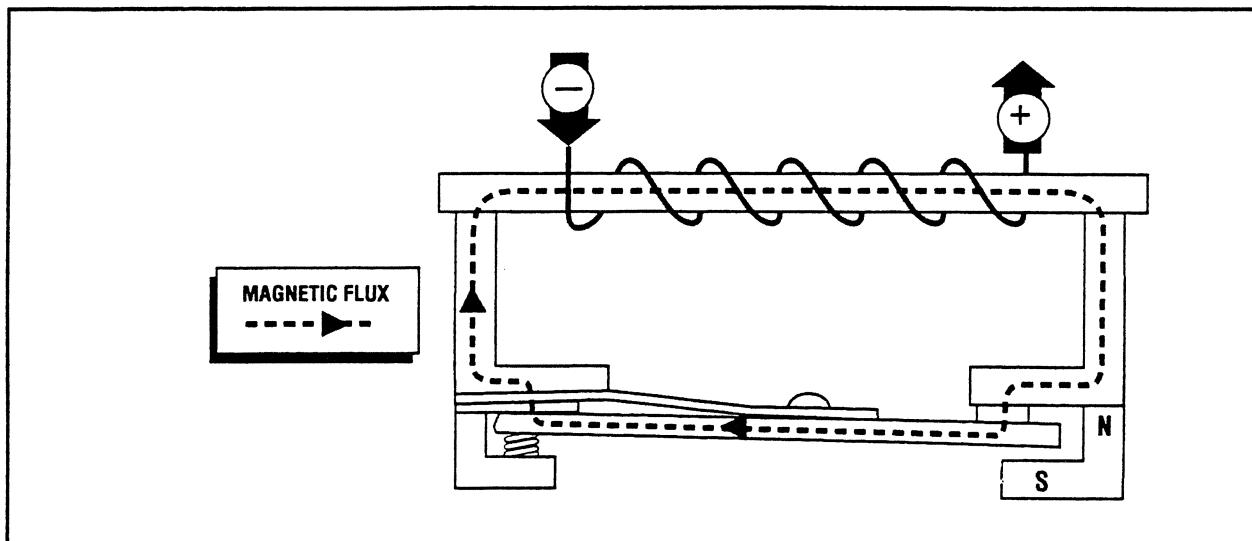


Figure 2-4. Biased Relay, Voltage of Normal Polarity Applied

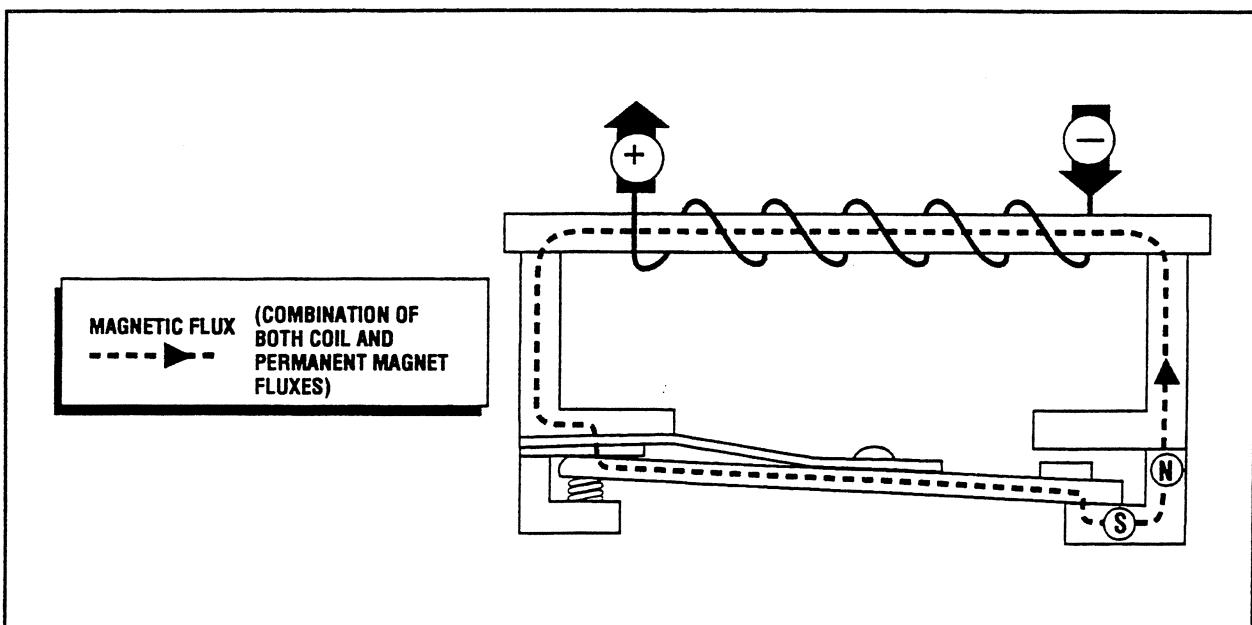
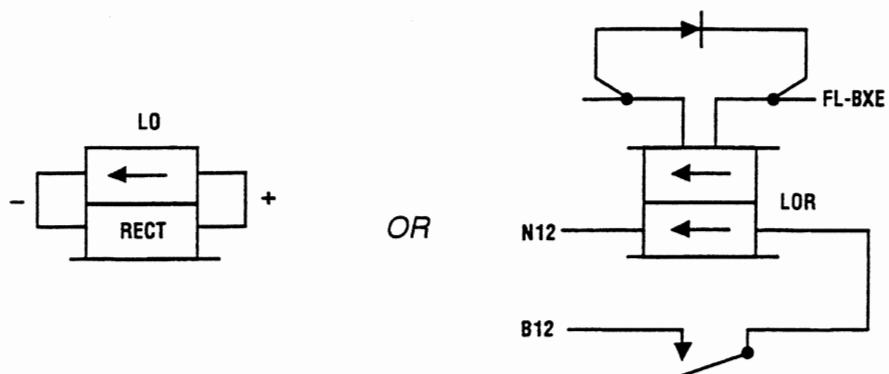


Figure 2-5. Biased Relay, Voltage of Reverse Polarity Applied

2.4 LIGHT OUT RELAYS

The PD-1 Light Out Relay is designed for signal light-out detection applications. The relay is energized when the signal lamp being monitored is lit. It is deenergized when the lamp is burnt out. The relay is a biased neutral relay with two coils, that are electrically separate but magnetically coupled. The schematic symbol for the light out relay is:



One of the coils (0.15 or 0.37 ohms) is wired between relay terminals L10 and R10. Connected between these terminals and in parallel with the relay coil is a diode rectifier. In a signal lighting circuit, the signal's ac voltage is applied through this light out relay coil and rectifier circuit to the signal lamp. When a signal lamp's filament is not open, ac current flows through the 0.15 and 0.37 ohm coil and rectifier circuit. Polarity of the rectifier with respect to the coil must be correct for the relay to operate when the ac voltage is applied. As shown in Figure 2-6, energy is applied to the relay coil during the positive excursions of the ac power source. Being a biased relay, when the coil polarity is correct, the relay energizes.

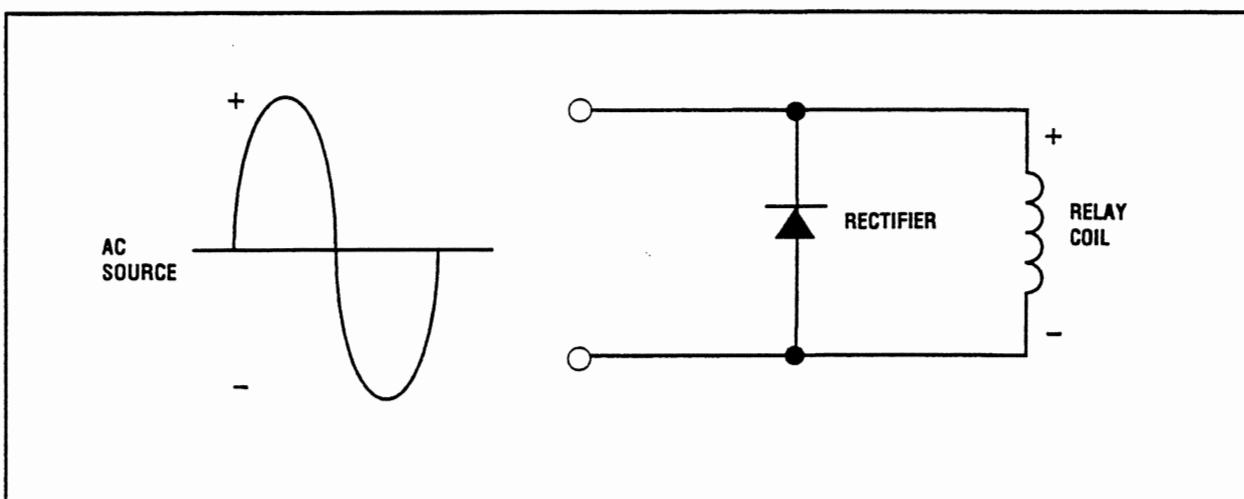


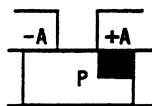
Figure 2-6. AC Operated Relay Coil

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After the relay energizes, a path is completed through a set of front contacts of the Light Out Relay. Through these front contacts, dc voltage of the correct polarity is applied to the second coil (350 or 0.086 ohms) through terminals L8 and L9 of the relay. After the relay is energized by ac lamp current flowing through the first coil, energizing of the second coil holds the relay energized.

2.5 MAGNETIC STICK RELAYS

The magnetic stick relay is similar in construction and operation to the biased relay. However, the armature is pivoted at its center and uses two permanent magnets; one at each end of the armature. The schematic symbol for the magnetic stick relay is:



The design is such that the armature remains in the last operated position with full contact pressure after energy is removed from the relay coil. The relay moves to the alternate position when dc voltage of opposite polarity is applied.

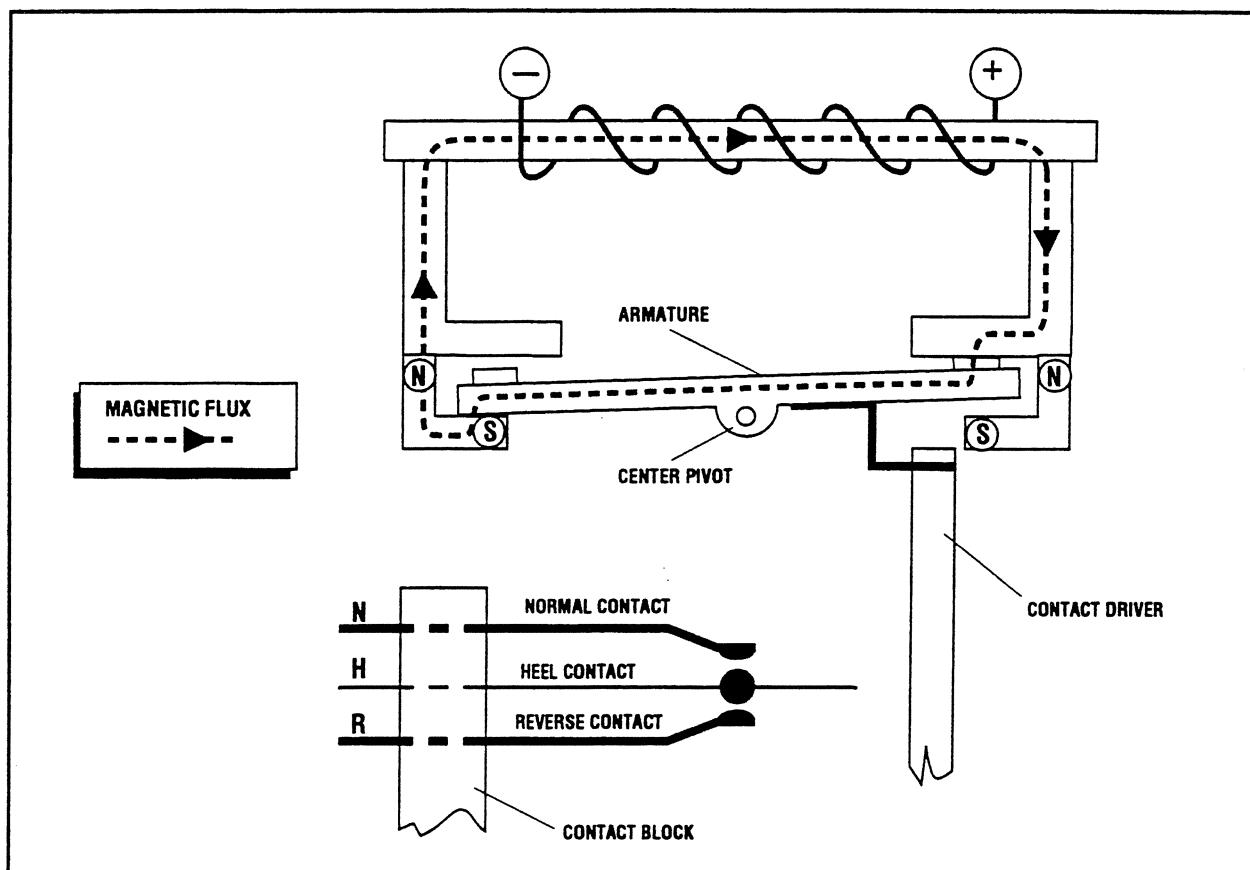


Figure 2-7. Magnetic Stick Relay, Normal Polarity Voltage Applied

With polarity of the permanent magnets as shown in 2-7, and current flowing in the coil as indicated, the armature rotates counterclockwise. This action pulls up the contact driver, which, in turn, closes the heel and normal contacts.

When the polarity of the voltage across the coil is reversed, the resultant magnetic flux, as shown in Figure 2-8, forces the armature to rotate clockwise. This pushes the contact driver down, which, in turn, opens the normal contacts and closes the heel and reverse contacts.

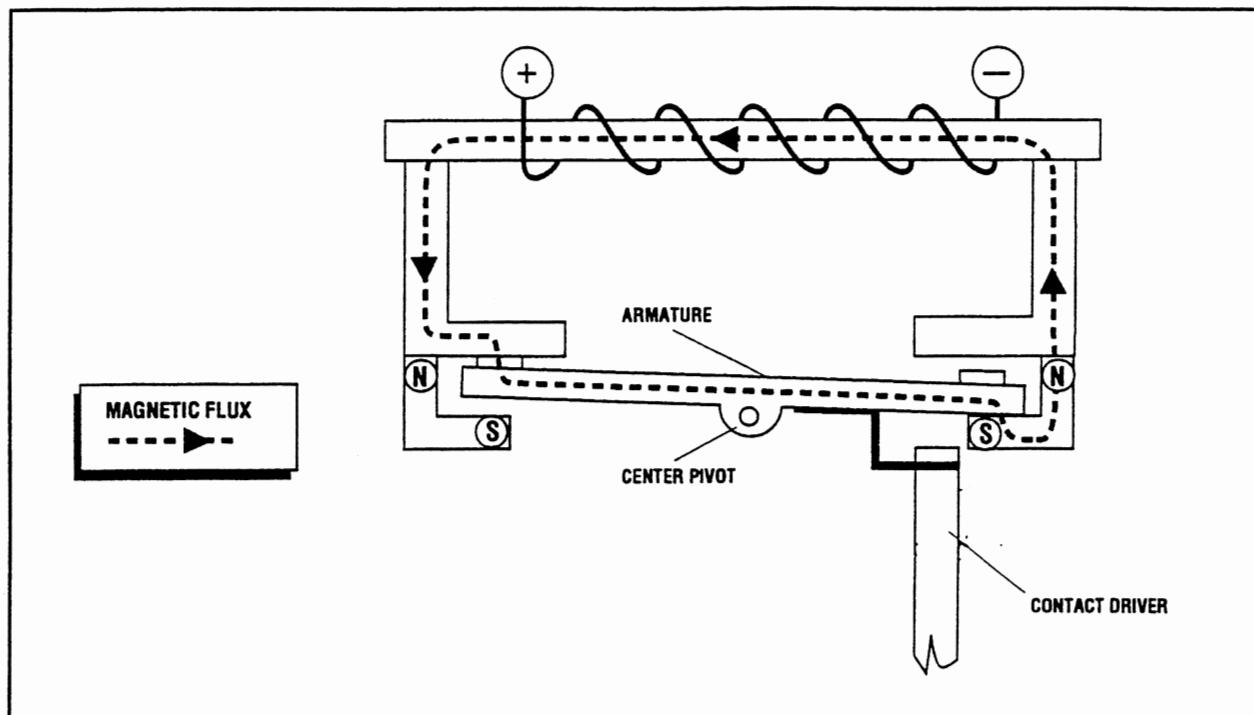


Figure 2-8. Magnetic Stick Relay, Reverse Polarity Voltage Applied

2.6. MAGNETIC HEAVY-DUTY AND HEAVY-DUTY CONTACTS

2.6.1 Magnetic Blowout Relay

The biased magnetic blowout relay is similar in structure and operation to the dc biased relay. The exception is the use of magnetic blowout heavy duty contacts. Small permanent magnets are affixed to the contact springs, behind and close to the heavy duty tips. The purpose and effect of these magnets is to disperse or blow out an electric arc before it has the chance to grow and burn and otherwise damage the contacts. The coil symbol for the biased magnetic blowout relay is the same as that of the standard biased relay described in paragraph 2.3. The schematic symbol for the magnetic blowout heavy-duty contact is:



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This type relay is used in conjunction with other relays to control electric switch machines.

2.6.2 Heavy-Duty Contact Relay

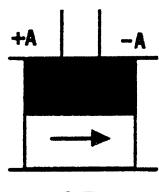
The heavy-duty contact relay is a biased relay with heavy-duty contacts. The relay is similar in structure and operation to the dc biased relay with the exception of having heavy-duty contacts which can carry loads up to 15 amperes. Standard contacts are designed to carry loads up to 4 amperes. The coil symbol for the heavy-duty contact relay is the same as the biased relay, but its contact symbol is:



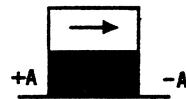
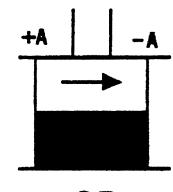
2.7 SLOW PICKUP AND SLOW RELEASE (DROPAWAY) RELAYS

The slow pickup and slow release relays are biased relays, having special timing characteristics. Slow pickup and slow release refers to the relative timing of relay action. The desired pickup and release timing characteristics are achieved through the use of RC circuits. The schematic symbols for these relays is:

SLOW PICKUP



SLOW DROPAWAY



Timing characteristics are changed externally by combinations of coil connections, and snubbing of coil circuits by combinations of rectifiers, capacitors, and resistors (Figure 2-9). As stated on the PD-1 Application Information Sheets for slow pickup and slow release relays, the snubbing components may be external or built into a plug coupler.

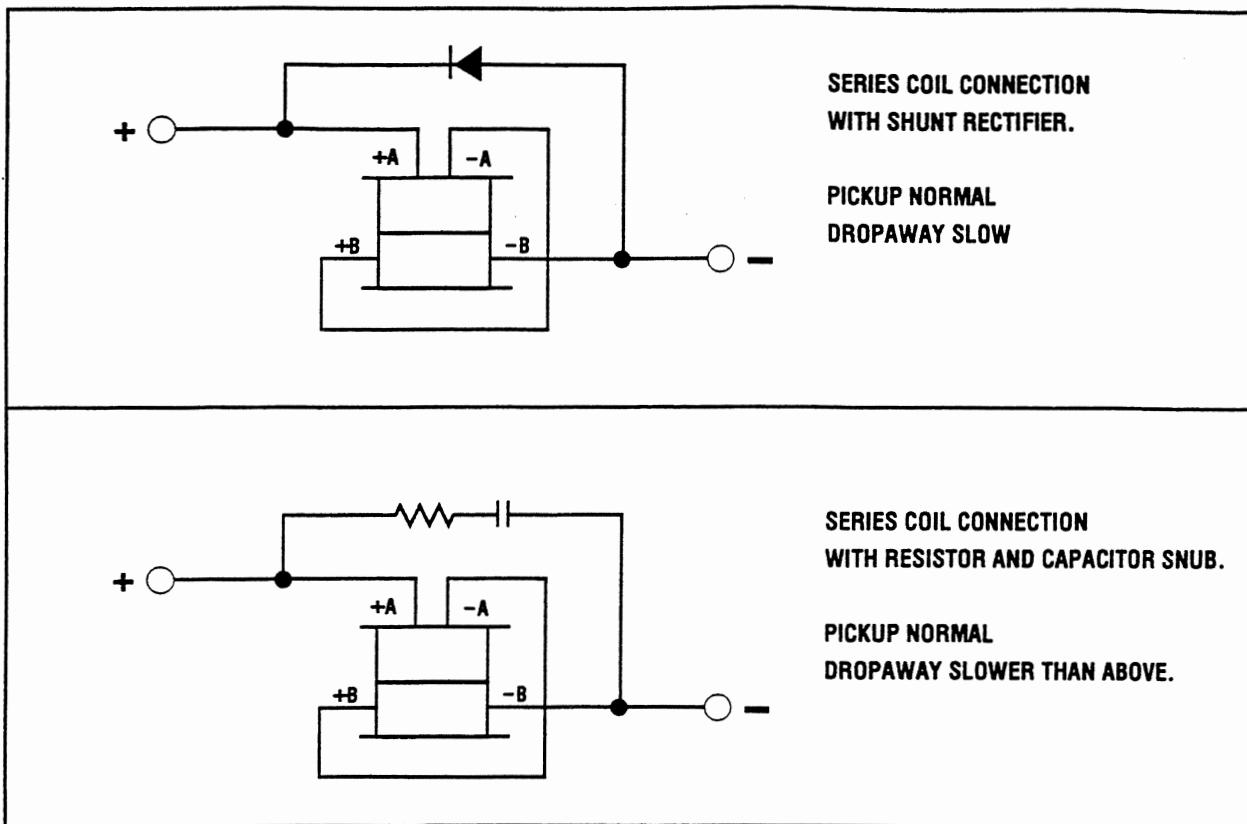
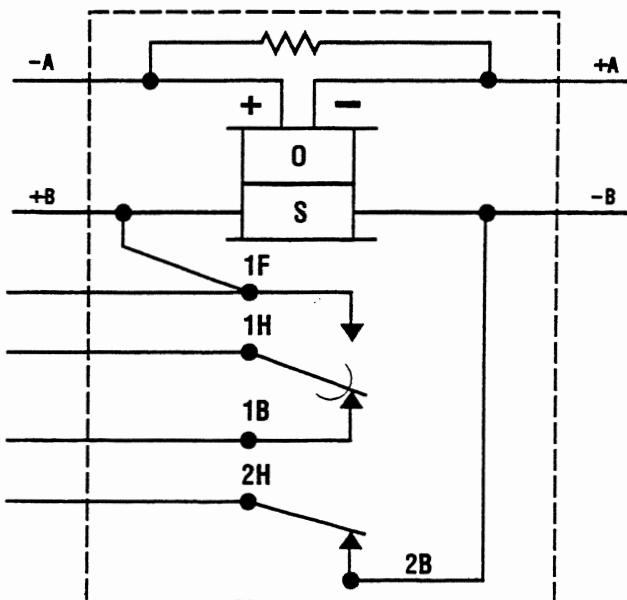


Figure 2-9. Typical Slow Release Snubbing Circuit.

2.8 SWITCH OVERLOAD RELAYS

Switch overload relays are used to provide protection from overload currents for dc switch machine motors. The operation time for these type relays is inversely proportional to the magnitude and duration of the overload current. The schematic symbol for the overload relay is:



The switch overload relay is placed in the switch machine motor circuit. The relay is constructed with two coils; an operating winding and a stick winding. The operating winding is wired in series with the switch machine motor. When current is excessive, the operating winding energizes the relay. The relay is held energized by the stick winding, causing deenergization of switch control relays that directly control the motor circuit.

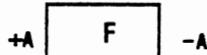
The activation time, hence the sensitivity of the overload relay, is determined by a low resistance element connected across the operating winding. The resistance element has a positive temperature coefficient so that a substantial increase in current causes a proportional increase in resistance. During normal current conditions, most of the current passes through the resistance element with little or no current through the operating coil. An increase over the normal current level increases the resistance of the element, causing more current to flow through the operating coil. If the overload persists, the operating coil receives sufficient current to activate the relay armature.

2.9 FLASHER RELAY

The PD-1 flasher relay is a biased neutral relay with heavy duty front and back contacts. When the relay is used with an external electronic driver unit (Figure 2-10), it will provide between 41 and 45 flashes per minute when the voltage applied is 8-18V dc. The driver unit is assembled in a package that plugs into a standard octal socket. The driver unit contains shop-adjustable controls to set the on-time and off-time of the flasher. The schematic symbol for a flasher relay is:



OR



UNION SWITCH & SIGNAL

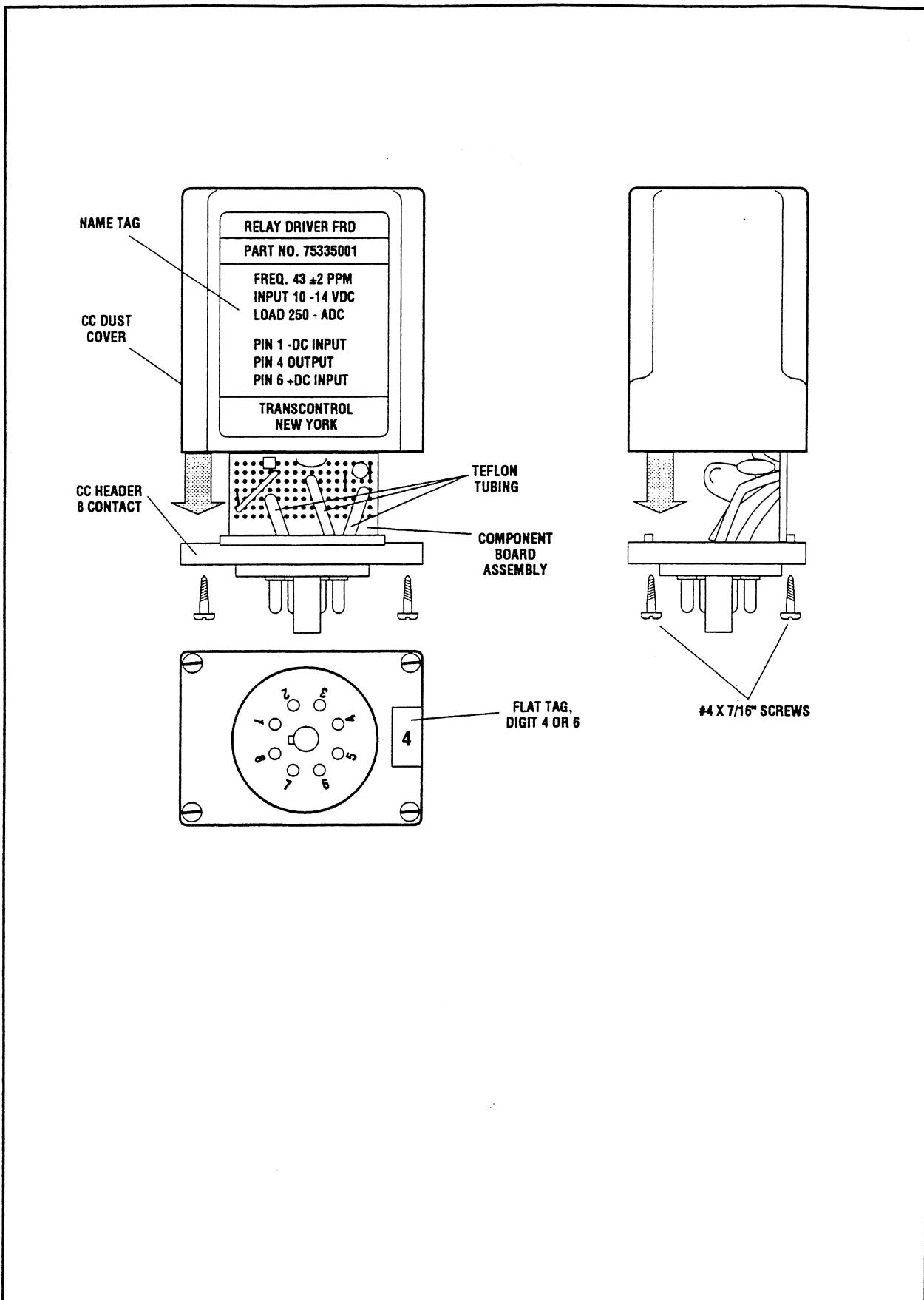


Figure 2-10. Flasher Relay Driver Unit

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SECTION III

INSPECTION AND TEST

3.1 INTRODUCTION

This section contains procedures to be used to periodically inspect and test PD-1 Vital Relays at their field locations. How often each type of vital relay is to be inspected and tested is specified in its Application Information Sheet contained in the Appendix at the rear of this manual.

3.2 RECOMMENDED TEST EQUIPMENT

DC Relay Test Stand
Source of 120V, 60Hz
power
0-72Vdc Power Supplies (2)
0-40Vdc Power Supplies (2)
DC Voltmeter
DC Ammeter
AC Voltmeter
AC Ammeter
Low Resistance Ohmmeter 912B
Time Interval Meter 911A
Code Rate Monitor 912A
On-Time Meter Simpson TS-111
Test Leads, minimum of 2 sets, color coded (Red and Black)

3.3 FIELD INSPECTION

3.3.1 Static Inspection

The following static inspection can be performed with the relay mounted in its operating position, or removed from its plug coupler.

Check each inactive relay for the following

- a. Abnormally pitted and/or burned contacts
- b. Contact misalignment.
- c. Corrosion or other contamination of relay parts.
- d. Loose parts inside cover.
- e. Broken seal.
- f. Cracked or broken cover.

3.3.2 Dynamic Inspection

With the relay installed in its operating position or in the Relay Test Stand, check the following while operating the relay:

Armature moves freely and that moving heel contacts meet the front and back contacts squarely and practically simultaneously.

3.4 TEST PERFORMANCE

The PD-1 relay tests can be performed without the DC Relay Test Stand. But the test stand simplifies the test setup and reduces the time needed to test the relays. The following paragraphs describe how to test each type of relay with and without the test stand.

Whether or not the test stand is used, the basic test setup is as shown in Figure 3-1.

NOTE

As a general rule when testing dc relays, such as the PD-1 relays, an ammeter is used to test relays with a coil resistance under 100 ohms, and a voltmeter is used to test relays with a coil resistance over 100 ohms.

3.5 DC RELAY TEST STAND

The DC Relay Test Stand is manufactured by US&S. Its formal title is Relay Test Stand PN-150/PN-250 Relays. To enable its use to test PD-1 relays, a Plug Coupler Adapter is provided with the test stand. The Plug Coupler Adapter is wired to a PN-250 frame which is inserted into the PN-250 mounting base on the test stand. The Plug Coupler Adapter sits on a test bench or other flat surface and the PD-1 relay to be tested is then inserted into the Plug Coupler Adapter.

The DC Relay Test Stand is described in detail in US&S Service Manual 6360. The manual describes the test stand and contains detailed procedures for the testing of PN type dc relays. To reduce frequent reference to the manual, the following information is included in this manual.

Refer to Table 3-1 and Figure 3-2 for the location and function of each test stand control and indicator. It must be remembered that all of the test stand controls and indicators are not used for the testing of PD-1 relays.

Located in the center of the test stand (Figure 3-2, item 19) are 30 contact indicators. The contact indicators are arranged in five rows of six indicators per row. During the tests, the indicators provide a visual indication of the relay's contact configuration and whether they are open or closed. During PD-1 relay testing, as shown in Figure 3-3, the contact indicators in columns 1 through 3 only are used. Row A and D indicate Front contact closure, Row B and E indicate Back contact closure. The Heels (H) can be imagined

as located between rows A and B, and also between rows D and E. In this basic six Front and six Back contact configuration, row 3.6 TESTS3.

6.1 Biased Relay Performance Tests

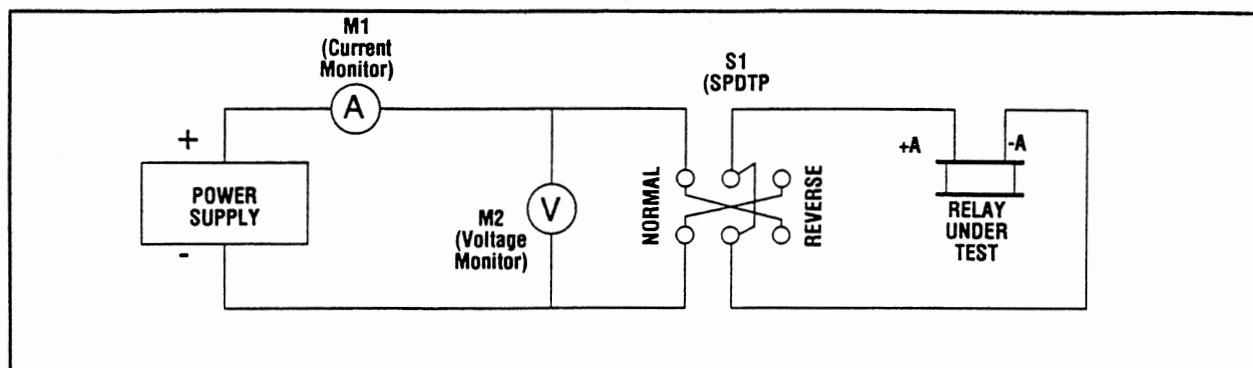


Figure 3-1. Biased Relay Test Setup

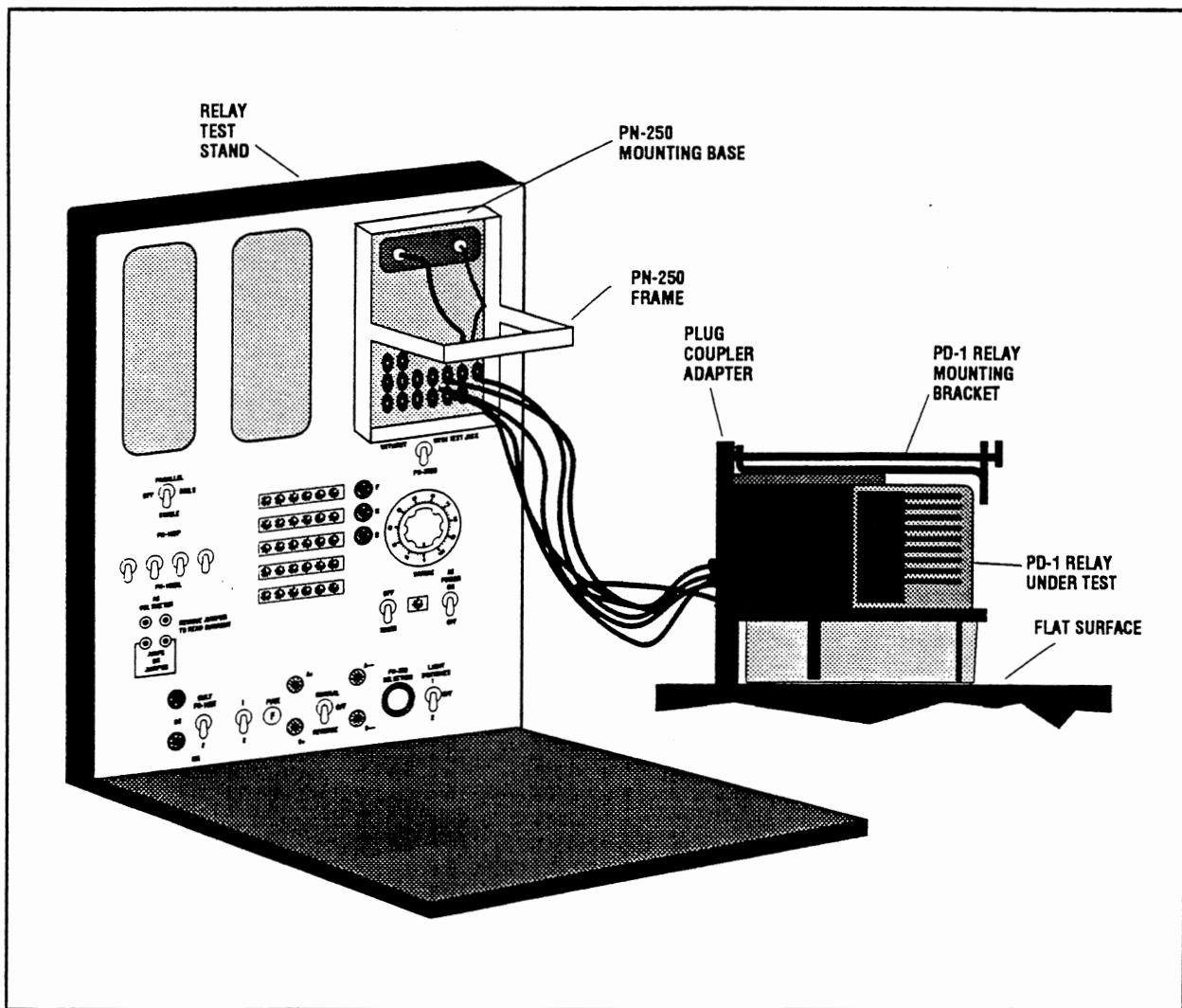


Figure 3-1A. Plug Coupler Adapter

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Table 3-1. DC Relay Test Stand, Controls and Indicators

REF	ITEM	FUNCTION
1	Relay Mounting Base PN-250	Provides the proper position and connections for testing the PN-250 and PF-256 style relays. *
2	PN-250 Switch (S2)	In the WITH TEST JACK position, the input to the relay coil is applied to the TEST contact. In WITHOUT position, input to coil is directly to the coil receptacle.
3	VARIAC Control (V1)	Varies the ac power input for testing the light out and power transfer relays. The variable input is the left ac jacks (15 and 16)
4	AC POWER Switch (S1)	In ON position, 115Vac line is connected to VARIAC (3) and transformer that powers the lights. In OFF, power is cut.
5	Power Indicator (L1)	Lights when ac power is available to light the Contact Indicators (L2) (19).
6	PN-250 LIGHT SELECTION SWITCHES (S12)	In 1 position, with rotary switch S11 (7), connects PN-250 base for testing other than PN-250B relays. In 2 position, base is connected to test PN-250B relays. In OFF position, two front bottom row contacts are disconnected.
7	PN-250 LIGHT SELECTION SWITCHES (S11)	In 1 position, with toggle switch S12 (6), connects PN-250 base for testing 6FB-6F-3B PN-250B relay. In 2 position, base is connected for testing 8FB-4F-2B PN-250B and PF-256 flasher relays.
8	Relay Coil Block Jacks A+/A-	Provides connections to single coil relays or, with item 10 (Jacks B+/B-) connects two coil relays in series or parallel.
9	Coil Polarity Switch (S10)	When using a power supply with Jacks A+/A- (8) and B+/B- (10), the NORMAL position applies positive (+) voltage to A+ (B+) terminals and negative (-) voltage to A- (B-) terminals of biased, timer, light out, or power transfer relays. In REVERSE position, voltage to the A (B) terminals are reversed. In OFF position, voltage is removed from both coil terminals.

* Used to connect the PD-1 relay under test to the test stand via the Plug Coupler Adapter

UNION SWITCH & SIGNAL

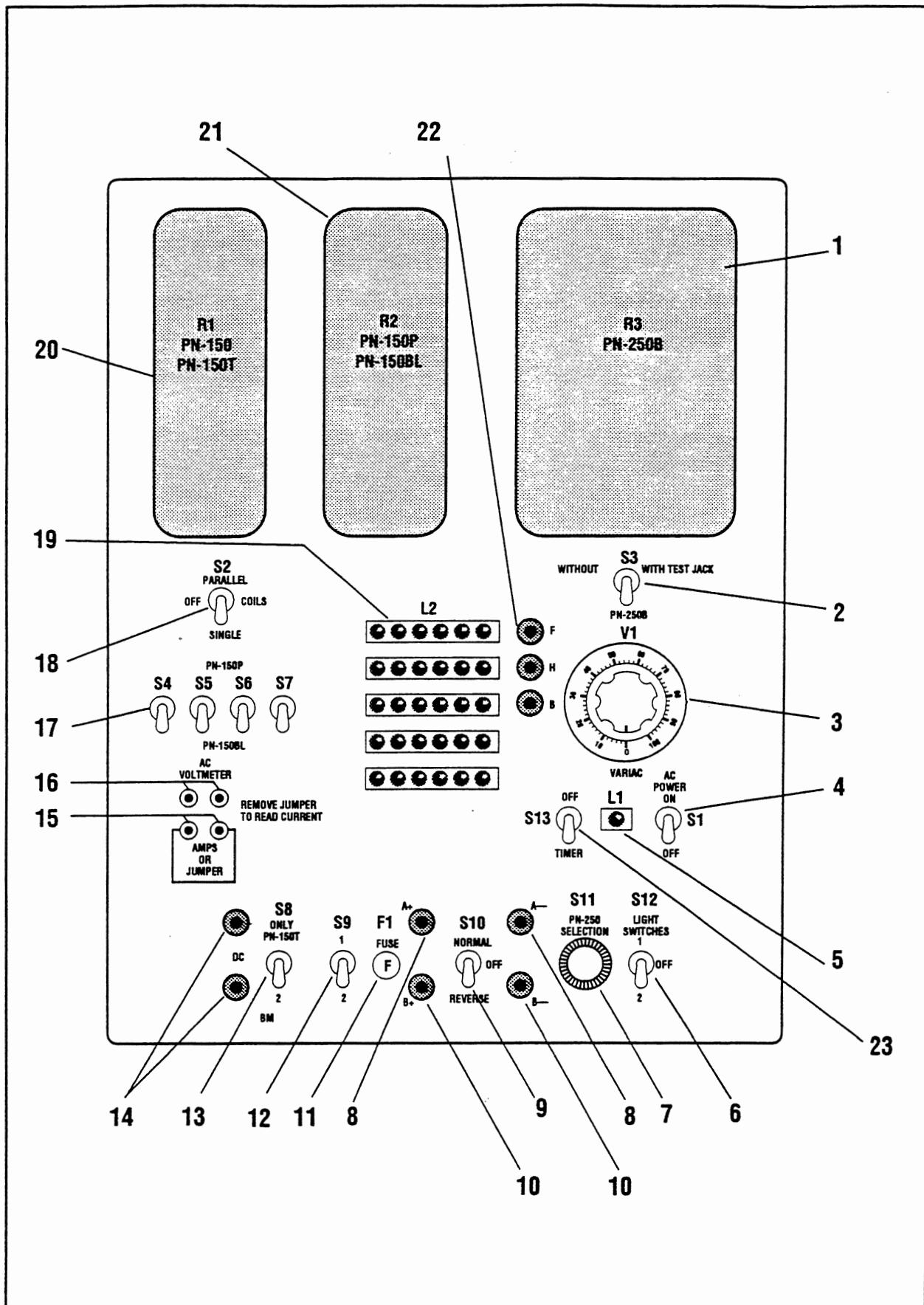


Figure 3-2. DC Relay Test Stand, Controls and Indicators

UNION SWITCH & SIGNAL

Table 3-1. DC Relay Test Stand, Controls and Indicators (Cont'd)

REF	ITEM	FUNCTION
10	Relay Coil Block Jacks B+/B-	Provides connection to the second coil of two coil relays or, with item 8, connects two coil relays in series or parallel.
11	Fuse (F1)	Protects the VARIAC (3) and lights (L1 and L2) transformer.
12	PN-150 Contact Configuration Switch (S9)	In position 2, the PN-150 base is connected for testing relays with 6 Front/Back contacts. In position 1, the base is connected to test relays with 4 Front/Back, 2 Front, and 1 Back contacts.
13	Only PN-150T Switch (S8)	In the ONLY PN-150T position (up), the proper PN-150 base contacts are connected to the +DC/-DC jacks (14). The 2 position is used for all other PN-150 type relays.
14	DC +/- Jacks	Used with ONLY PN-150T switch (13) to supply input power to PN-150T relay.
15	AMPS or JUMPER Jacks	When using AC current for Power Transfer or Lightout relay tests the AC ammeter connects between these jacks. When voltage only is used, the jacks are jumpered.
16	AC VOLTMETER Jacks	Used for connecting an AC voltmeter across relay coil in conjunction with four switches (17).
17	PN-150L (Light out) / PN-150P (Power Transfer) Switches (S4,5,6,7)	In PN-150BL position (down), the PN-150BL/PN-150P base is connected to test the PN-150BL relay. In the PN-150P position, base is connected to test the PN-150P relay. OFF position must be used to test all other PN-150 and PN-250 type relays.
18	Coils Switch (S2)	In parallel position, the A and B relay coils are placed in parallel. In the single position they are separate.
19	Contact Indicators (L2)	Visually indicates the relay's contact configuration and when they are open or closed.

UNION SWITCH & SIGNAL

Table 3-1. DC Relay Test Stand, Controls and Indicators (Cont'd)

REF	ITEM	FUNCTION
20	Relay Mounting Base PN-150, PN-150T (R1)	Provides proper position and connections for testing PN-150 and PN-150T style relays.
21	Relay Mounting Base PN-150P, PN-150BL (R2)	Provides proper position and connections for testing PN-150P and PN-150BL style relays.
22	F/H/B Jacks	Used with TIMER switch (23) to provide access to set of front, heel, and back contacts.
23	TIMER Switch	In OFF position, voltage is fed to lights in column 1, Rows D and E, to light the lights. In TIMER position, voltage is removed to allow flash rate, on-time, and timing measurements to be made.

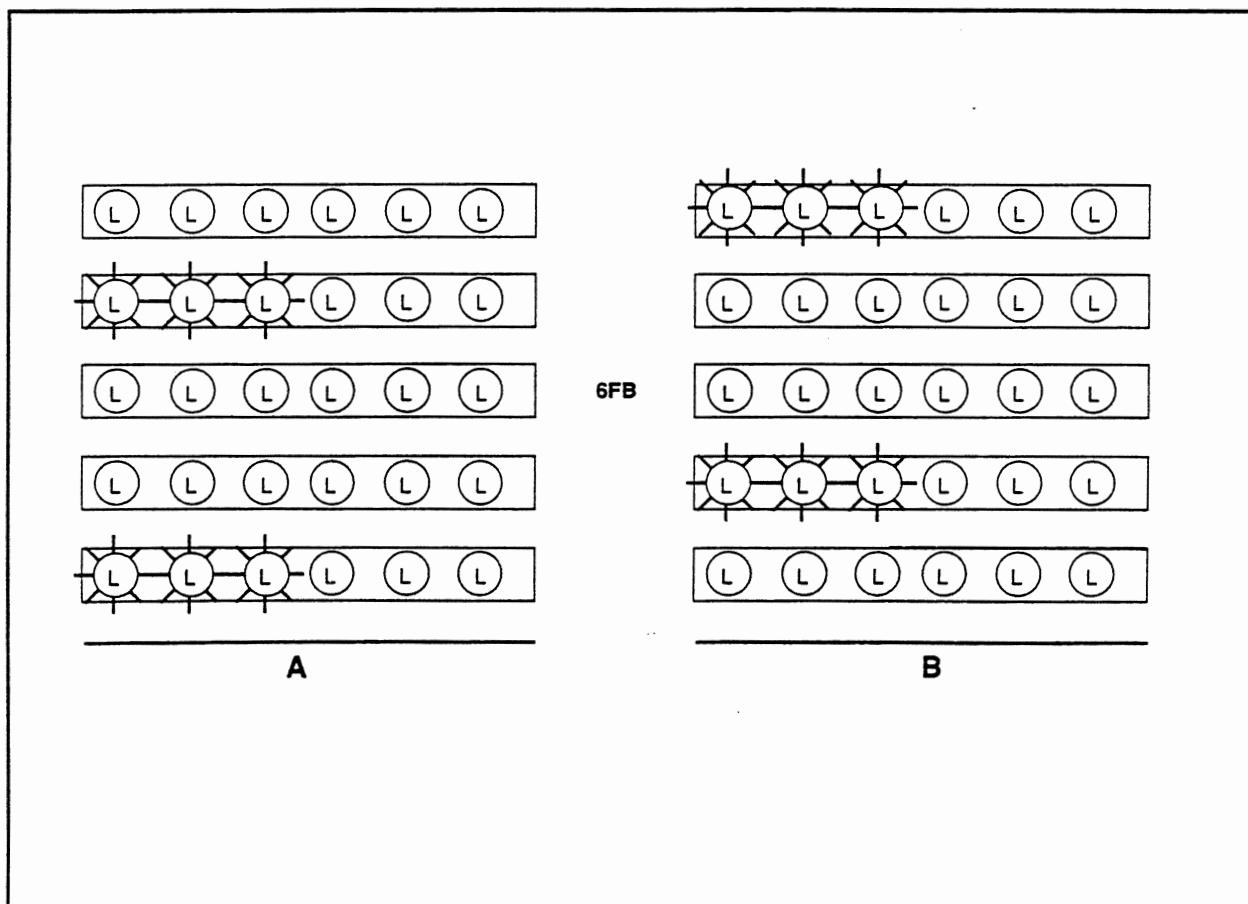


Figure 3-3. Basic Contact Indicators Configuration

3.6 TESTS

3.6.1 Biased Relay Performance Tests

The following procedures determine the Drop-Away (Release), Pickup, and Working values of PD-1 types of biased neutral relays.

3.6.1.1 Recommended Test Equipment

Power Supply 0-40Vdc

DC Voltmeter

DC Ammeter

DC Relay Test Stand or similar test setup per Figure 3-1.

3.6.1.2 Test Setup. When a DC Relay Test Stand is used, the following procedure creates the test setup required. When the test stand is not used, the test setup shown in Figure 3-1 must be created. The non-test-stand setup can use the rack mounted plug coupler/relay but all system wiring connections must first be removed from the plug coupler. All test connections can then be made to the rack mounted plug coupler.

In the following test stand setup procedure, the item numbers are those used on Figure 3-2:

- a. Ensure the AC POWER switch (4) and TIMER switch (23) are set to OFF.
- b. Ensure the power switch on the dc power supply is set to off, and adjust its output voltage control to the 0V output position.

NOTE

As a general rule when testing relays, such as the PD-1 relays, an ammeter is used to test relays with a coil resistance under 100 ohms, and a voltmeter is used to test relays with a coil resistance over 100 ohms.

- c. Using test leads, connect either the dc voltmeter or ammeter (per above Note) to both the power supply output and the relay coil block jacks A+/A- (8), observing the correct polarity.

NOTE

The above connections are for single coil relays. For double coil relays, whose coils are wired in series, the meter is connected to the A+ and B- jacks with A- and B+ jacks jumpered.

- d. Set the PN-150BL/PN-150P switches (17) to OFF (center).
- e. Set the COILS switch (18) to the SINGLE position.
- f. Set the PN-250 LIGHT SELECTION SWITCH (7) to the 1 position.
- g. With the PD-1 Plug Coupler Adapter seated on a flat surface, insert its cable's PN-250 frame into the PN-250B base on the test stand.
- h. Insert the PD-1 relay to be tested into the Plug Coupler Adapter.
- i. Set the AC POWER switch (4) to ON and the dc power supply to on.
- j. Set the Coil Polarity switch (9) to the NORMAL (up) position.
- k. Set the PN-250 switch (2) to the WITH TEST JACK position.

3.6.1.3 Biased Relay Test Stand Procedure.

- a. Slowly adjust the power supply output control to increase the output, as indicated on the dc voltmeter or ammeter, as appropriate, to Charge the relay. (The Charge value is four times the relay's working value, which is specified on the relay's Application Information Sheet.) The Contact Indicators should change from those lit in Figure 3-3A to those shown lit in Figure 3-3B.
- b. Insert a "stick" into the front test jack. Observe the relay deenergizes (Figure 3-3A).
- c. Remove the "stick" and observe the relay energizes (Figure 3-3B).
- d. Set the Coil Polarity switch (9) to the REVERSE position and observe the relay deenergizes.
- e. Set the Coil Polarity switch to the NORMAL position and observe the relay again energizes.
- f. Slowly adjust the dc power supply controls to reduce the output until the relay deenergizes. Note the value indicated on the meter. This is the Minimum Release (DropAway) value, and should not be less than the In-Service Application Limit value specified on the relay's Application Information Sheet.
- g. Further reduce the power supply output, if necessary, until the relay armature rests on the permanent magnet extension. Note the value indicated on the meter. This

is the Minimum Full Release (Drop-Away) value, and should not be less than the In-Service Application Limit value specified on the relay's Application Information Sheet.

- h. Using the dc power supply controls, reduce the output to zero. Then set the Coil Polarity switch (9) to the OFF position for 1 second, and then move it back to the NORMAL position.
- i. Slowly increase the power supply output until the relay energizes (stop pin closes against the pole face). Note the meter value. This is the Pickup Maximum value and should not be greater than the Inservice Application Limit value specified on the relay's Application Information Sheet.

3.6.1.4 Biased Relay Test Without Test Stand. Refer to paragraph 3.5, and create test setup per Figure 3-1. Proceed as follows:

- a. Set switch S1 to Normal.

NOTE

As a general rule when testing relays, such as the PD-1 relays, an ammeter is used to test relays with a coil resistance under 100 ohms, and a voltmeter is used to test relays with a coil resistance over 100 ohms.

- b. Turn on the dc power supply.
- c. To Charge the relay, observe the meter per the above Note, and slowly adjust the power supply output control to increase the output to four times the relay's working value, which is specified on the relay's Application Information Sheet. The Contact Indicators should change from those lit in Figure 3-3A to those shown lit in Figure 3-3B. Note the relay stays energized as the output is increased.
- d. Set switch S1 to Reverse. Observe the relay deenergizes.
- e. Set switch S1 to Normal. Observe the relay energizes.
- f. Slowly adjust the dc power supply controls to reduce the output until the relay deenergizes. Note the value indicated on the meter. This is the Minimum Release (DropAway) value, and should not be less than the In-Service Application Limit value specified on the relay's Application Information Sheet.
- g. Further reduce the power supply output, if necessary, until the relay armature rests on the permanent magnet extension. Note the value indicated on the meter. This

is the Minimum Full Release (Drop-Away) value, and should not be less than the In-Service Application Limit value specified on the relay's Application Information Sheet.

- h. Using the dc power supply controls, reduce the output to zero.
- i. Slowly increase the power supply output until the relay energizes (stop pin closes against the pole face). Note the meter value. This is the Pickup Maximum value and should not be greater than the In-Service Application Limit value specified on the relay's Application Information Sheet.

3.6.2 Slow Release (Drop-Away) Relay Test

A slow release PD-1 relay is a biased relay. Its release, pick-up, and working values are tested in the same manner described in paragraph 3.6.1. Additionally, the release time must be checked, as described in the following procedure.

As with the biased relay tests, the slow release timing can be checked with or without the dc relay test stand. Both ways are described in the following paragraphs.

3.6.2.1 Recommended Test Equipment.

DC Relay Test Stand
0-40Vdc Power Supply
DC Voltmeter
DC Ammeter
Time Interval Meter US&S 911A

NOTE

Release Time is the time from opening of the relay coil circuit until the front contacts open. In performing each check of release time, the circuit shall first be opened and the voltage then be brought up from zero to the value specified, but not beyond.

3.6.2.2 Slow Release Test With Test Stand.

- a. With the relay mounted as described in paragraph 3.6.1.3 upon conclusion of the biased relay tests, set the TIMER switch (23) to the TIMER position (down).
- b. Using a Time Interval Meter (TIM) US&S Model 911A, disconnect the jumper leads from the A+/A- jacks (8) and connect them to the corresponding EXTERNAL POWER jacks (+) and (-) on the rear of the TIM, as shown in Figure 3-4.

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- c. Connect the TIM COIL jacks (Figure 3-5) to relay coil jacks A+/A- (8) (red to A+ and black to A-).
- d. Connect the TIM CONTACTS jacks across the F and H jacks (22).
- e. On the TIM, set the START/STOP switch to the STOP position and adjust the power supply output from zero up to the pick-up value specified on the relay's Application Information Sheet, but not beyond. Leave the power on the coil and proceed to the next step.

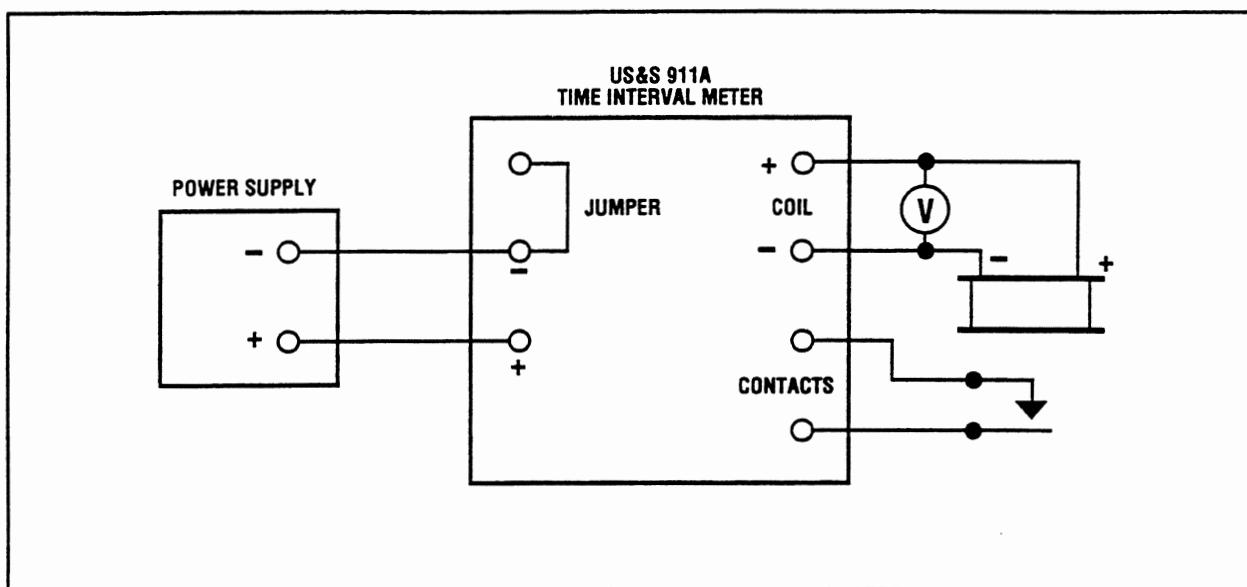


Figure 3-4. Operating Time Measurement, Test Setup

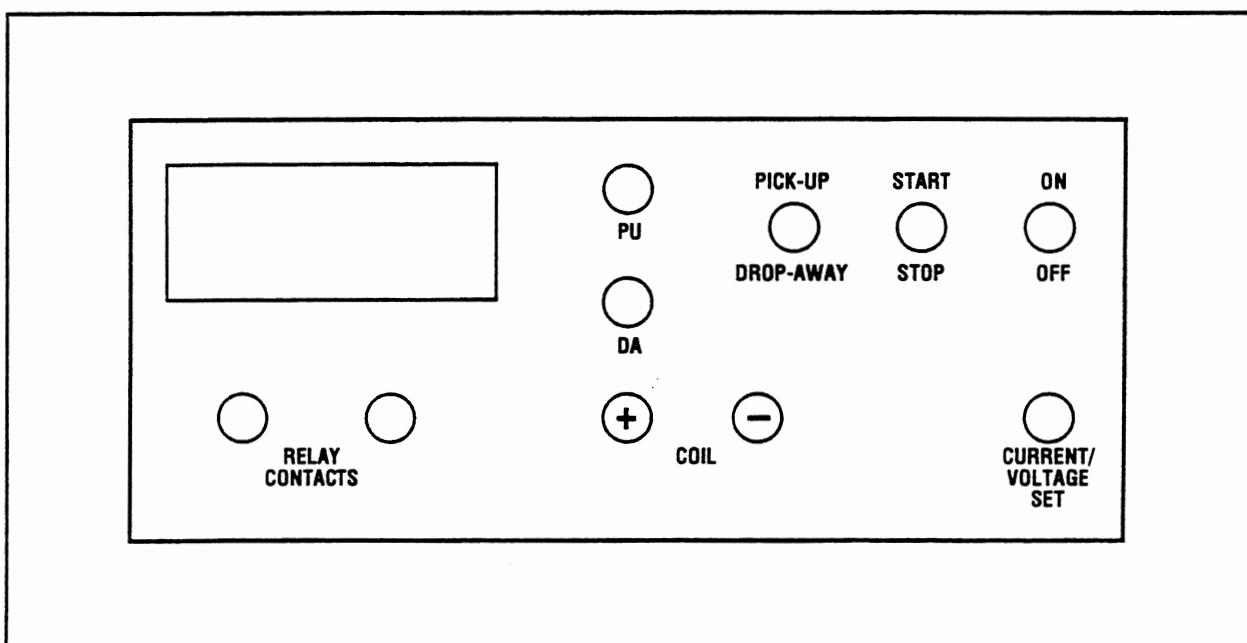


Figure 3-5. Time Interval Meter, US&S 911A, Front Panel

- f. On the TIM, set the START/STOP switch to the START position, and when the relay deenergizes (front contacts open), note the release time on the TIM. The time should not be less than the release time specified on the relay's Application Information Sheet.

3.6.2.3 Slow Release Test Without Test Stand.

- a. After completing the biased relay tests per paragraph 3.6.1.4, connect the relay into the test circuit shown in Figure 3-4.
- b. On the TIM (Figure 3-5), set the switches as follows:
 1. PICK-UP/DROP-AWAY switch to the DROP-AWAY position.
 2. START/STOP switch to the STOP position.
 3. ON/OFF switch to the ON position.
- c. Set the START/STOP switch to the START position. The display will start timing, then stop, and the DA indicator will light when the relay drops. The value should not be less than the release time specified on the relay's Application Information Sheet.

3.6.3 Slow Pick-Up Relay Test

A Slow Pick-Up PD-1 relay is also a biased relay. Its release, pick-up, and working values are tested as described in paragraph 3.6.1. Additionally, the pick-up time must be checked, as described in the following paragraphs.

As with the biased relay tests, the slow release timing can be checked with or without the dc relay test stand. Both ways are described in the following paragraphs.

3.6.3.1 Recommended Test Equipment.

DC Relay Test Stand
0-40Vdc Power Supply
DC Voltmeter
DC Ammeter
Time Interval Meter US&S 911A

NOTE

Pick-Up Time is the time from closing of the relay coil circuit until the front contacts close. There shall be a minimum of series resistance in the circuit, and the specified voltage shall be measured with the circuit closed.

3.6.3.2 Slow Pick-Up Test With Test Stand.

- a. With the relay mounted as described in paragraph 3.6.1.3 upon conclusion of the biased relay tests, set the TIMER switch (23) to the TIMER position (down).
- b. Using a Time Interval Meter (TIM) US&S Model 911A (Figure 3-5), disconnect the jumper leads from the A+/A- jacks (8) and connect them to the corresponding EXTERNAL POWER jacks (+) and (-) on the rear of the TIM, as shown in Figure 3-4.
- c. Connect the TIM COIL jacks (Figure 3-5) to relay coil jacks A+/A- (8) (red to A+ and black to A-).
- d. Connect the TIM CONTACTS jacks across the F and H jacks (22).
- e. On the TIM, set the START/STOP switch to the STOP position and the DROPAWAY/PICKUP switch to the PICKUP position. Set the power switch to the ON position.
- f. On the TIM, set the START/STOP switch to the START position, and when the relay energizes (front contacts close,) note the pick-up time on the TIM. The time should be not be less than the pick-up time specified on the relay's Application Information Sheet.

3.6.3.3 Slow Pick-Up Test Without Test Stand.

- a. After completing the biased relay tests per paragraph 3.6.1.4, connect the relay into the test circuit shown in Figure 3-4.
- b. On the TIM (Figure 3-5), set the switches as follows:
 1. PICK-UP/DROP-AWAY switch to the PICK-UP position.
 2. START/STOP switch to the STOP position.
 3. ON/OFF switch to the ON position.
- c. Depress the CURRENT/VOLTAGE SET pushbutton on the TIM and charge the relay in the normal direction as described in paragraph 3.6.1.3 step a, then reduce the voltage to that specified in step i.
- d. Set the START/STOP switch to the START position. The display will start timing, then stop, and the PU indicator will light when the relay picks. The value should not be less than the relay's pick-up time specified on the relay's Application Information Sheet.

3.6.4 Magnetic Stick Relay Test

3.6.4.1 Recommended Test Equipment.

DC Relay Test Stand
0-40Vdc Power Supply
DC Voltmeter
DC Ammeter

3.6.4.2 Magnetic Stick Relay Test With Test Stand.

- a. Create test setup as follows (see Figure 3-2 for item locations):
 1. Ensure that the AC POWER switch (4) and TIMER switch (23) are set to OFF.
 2. Ensure the dc power supply is off and its controls set for zero output.

NOTE

As a general rule when testing dc relays, such as the PD-1 relays, an ammeter is used to test relays with a coil resistance under 100 ohms, and a voltmeter is used to test relays with a coil resistance over 100 ohms.

3. Using jumpers, connect the dc voltmeter or ammeter per the preceding Note, to both the dc power supply output and the relay coil jacks A+/A- (8), observing correct polarity.
4. Set the PN-150BL/PN-150P switches (17) to the OFF (center) position.
5. Set the COILS switch (18) to the SINGLE position.
6. Set the PN-250 LIGHT SELECTION switches (7) to the 1 position.
7. With the PD-1 Plug Coupler Adapter seated on a flat surface, insert its cable's PN-250 frame into the PN250B base on the test stand.
8. Insert the PD-1 relay to be tested into the Plug Coupler Adapter.
9. Set the AC POWER switch (4) to ON and the dc power supply to on.
10. Set the Coil Polarity switch (9) to the REVERSE (down) position.

11. Set the PN-250 switch (2) to the WITH TEST JACK position.
- b. Test the relay as follows:
 1. Slowly adjust the power supply output control to increase the output, as indicated on the dc voltmeter or ammeter, as appropriate, to Charge the relay. (The Charge value is four times the relay's working value, which is specified on the relay's Application Information Sheet.) The Contact Indicators should change from those lit in Figure 3-3A to those shown lit in Figure 3-3B.
 2. Insert a "stick" into the front test jack. Observe the relay and lights do not change condition.
 3. Remove the "stick" and observe the relay does not change.
 4. Set the Coil Polarity switch (9) to the NORMAL position and observe the relay armature again reverses position (bottom contacts close).
 5. Set the Coil Polarity switch to the REVERSE position and observe the relay armature again reverses position (upper contacts close).
 6. Reduce the dc power supply output to zero and set the Coil Polarity switch to NORMAL.
 7. Slowly increase the dc power supply output until the relay armature reverses position and note the value. It should be between the Maximum and Minimum Pick-up and Working values.
 8. Reduce the power supply output to zero and set the Coil Polarity switch to REVERSE.
 9. Slowly increase the dc power supply output until the relay armature reverses position. Note the value indicated on the meter. It should not be more than the Pick-up In-Service Application Limit value specified on the relay's Application Information Sheet.

3.6.4.3 Magnetic Stick Relay Test Without Test Stand

- a. Create test setup as shown in Figure 3-2:
 1. Ensure that switch S1 is set to Reverse.
 2. Ensure the dc power supply is off and its output set to zero.

NOTE

As a general rule when testing dc relays, such as the PD-1 relays, an ammeter is used to test relays with a coil resistance under 100 ohms, and a voltmeter is used to test relays with a coil resistance over 100 ohms.

3. Slowly adjust the power supply output control to increase the output, as indicated on the dc voltmeter or ammeter, as appropriate, to Charge the relay. (The Charge value is four times the relay's working value, which is specified on the relay's Application Information Sheet.)
4. Reduce the power supply output to zero and set S1 to Normal.

b. Test the relay as follows:

1. Slowly increase the dc power supply output until the relay armature reverses position and normal (bottom) contacts close. Note the value. It should be no greater than the Pick-up Maximum In-Service Application Limit value specified on the relay's Application Information Sheet.
2. Reduce the power supply output to zero and set S1 to REVERSE.
3. Slowly increase the dc power supply output until the relay armature reverses position and reverse (upper) contacts close. Note the value. It should be no greater than the Pick-up Maximum In-Service Application Limit value specified on the relay's Application Information Sheet.

3.6.5 Switch Overload Relay Performance Test

The Switch Overload PD-1 relay cannot be tested using the DC Relay Test Stand.

3.6.5.1 Recommended Test Equipment.

Power Supply, 0-40VDC DC Ammeter, 0-25A
Heavy duty SPST switch
Power Resistor, 1 ohm, 200W
Stopwatch, capable of measuring 15 seconds with 0.1 sec accuracy

3.6.5.2 OS Relay Test Procedure. Test the operating characteristics of the switch overload relay as follows:

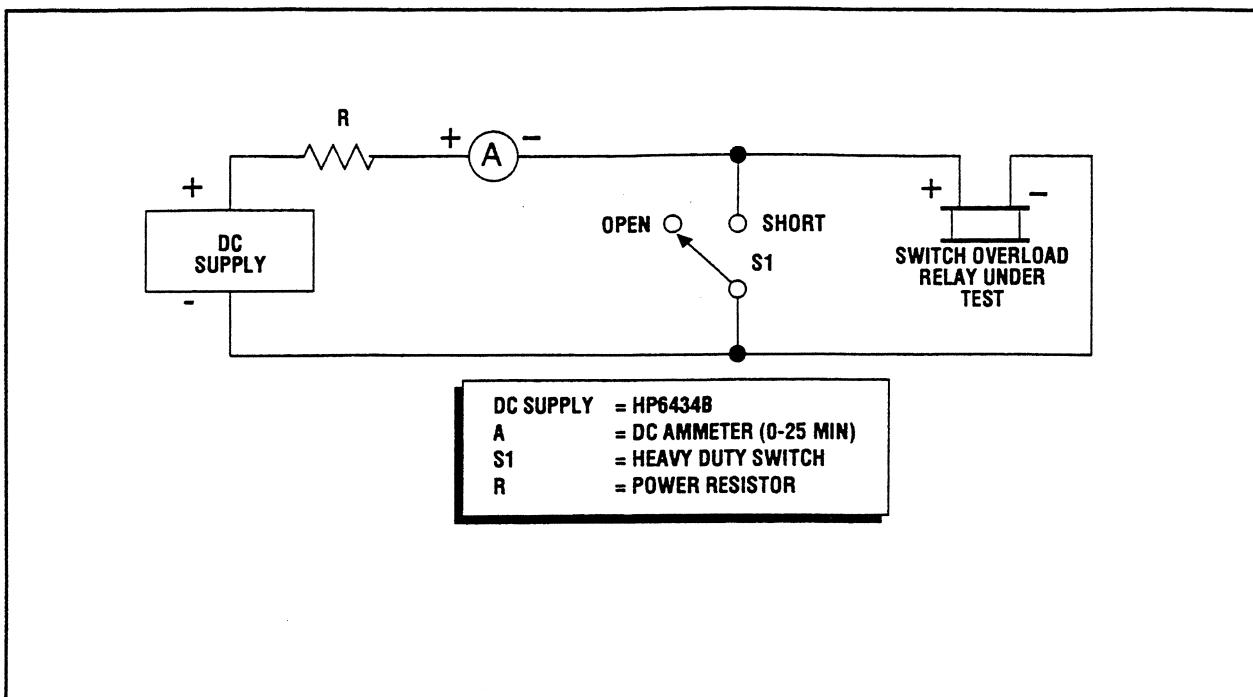


Figure 3-6. Switch Overload Stick Relay, Test Setup

- a. Connect the test setup as shown in Figure 3-6.
- b. Set the power supply output voltage control to 0 volts.
- c. Set switch S1 to the Short position.
- d. Adjust the dc power supply output control to obtain a current measurement equal to the Operating Time Amps specified on the relay's Application Information Sheet.
- e. Using a stopwatch to make the time measurement, simultaneously set switch S1 to the Open position and start the stopwatch.
- f. Stop the watch the instant the overload relay energizes. Also, remove power as quickly as possible. The time should be in seconds within the Operating Time specified on the relay's Application Information Sheet.

3.6.6 Flasher Relay Performance Test

The PD-1 Flasher relay is a biased relay inserted into a rear service plug coupler, that is equipped with a rear mounted octagonal socket into which a solid-state relay driver flashing unit is installed. The PD-1 Flasher Relay cannot be tested using the DC Relay Test Stand.

3.6.6.1 Recommended Test Equipment

3.6.6.2 Flasher Test Procedure.

- a. With the power supply off, connect the relay under test and the required test equipment as shown in Figure 3-7.
- b. With the S1 switch in its Off position, turn the power supply on, and slowly increase the output until the flasher starts to operate. The voltmeter should indicate between 10-18V dc.
- c. Simultaneously, set switch S1 to its On position and start the stopwatch.
- d. At the end of 3 minutes, set switch S1 to Off.
- e. Divide the counter indication by 3 to obtain a pulses-per minute reading. The reading should be between 41 and 45.
- f. With switch S1 set to Off and the flasher operating, connect an on-time meter between a heel and front contact pair and measure the on-time. Note this measurement.

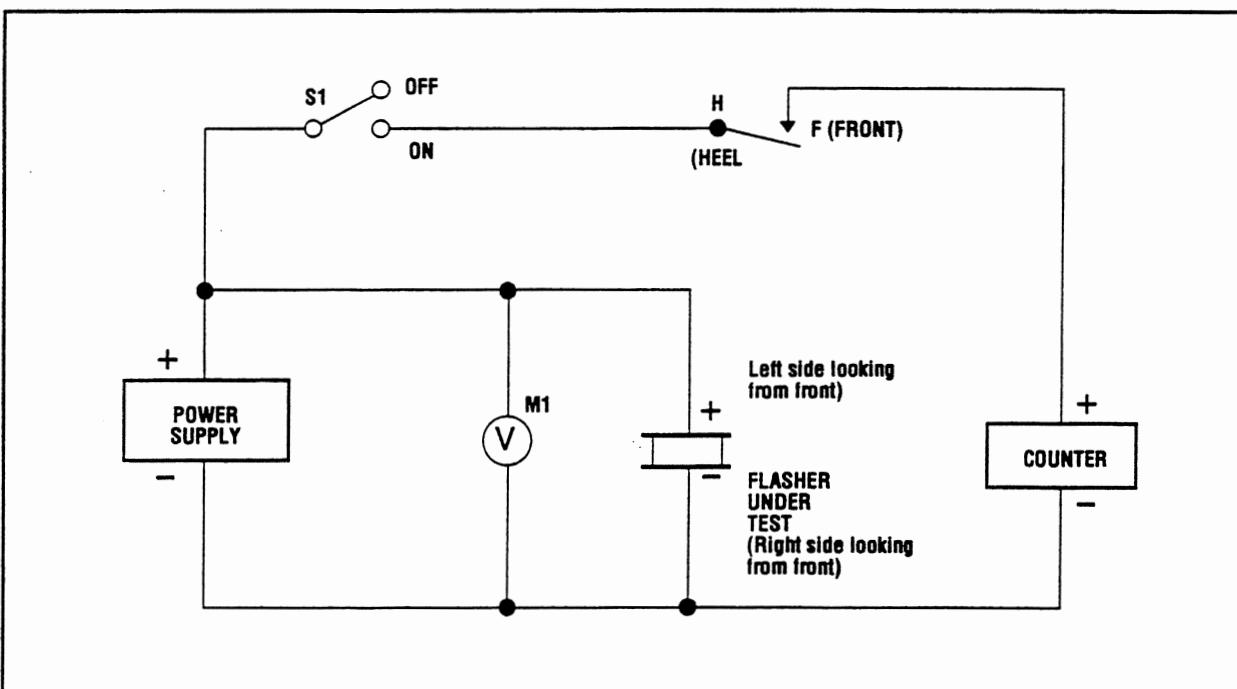


Figure 3-7. Flasher Relay, Test Setup

- g. Connect the on-time meter between a heel and back contact pair and measure the on-time. Note this measurement.
- h. The two measurements should be within 20% of each other.

3.6.7 Lightout Relay Test

The PD-1 Lightout Relay cannot be tested on the DC Relay Test Stand.

3.6.7.1 Recommended Test Equipment.

Variable transformer (Variac) T1	120Vac, 60Hz input
Filament transformer T2	12Vac, 60Hz secondary
AC ammeter	0 - 5A minimum
Resistor	4 ohms

3.6.7.2 Lightout Relay Test Procedure. Connect test circuit, as shown in Figure 3-8, and proceed as follows:

WARNING

Voltage and current dangerous to life are present. Use one hand to make connections.

- a. Set switch S1 to the Off position.
- b. Set Variac output control to the minimum setting.
- c. Connect circuit to 120Vac, 60Hz line.
- d. Set switch S1 to the On position.

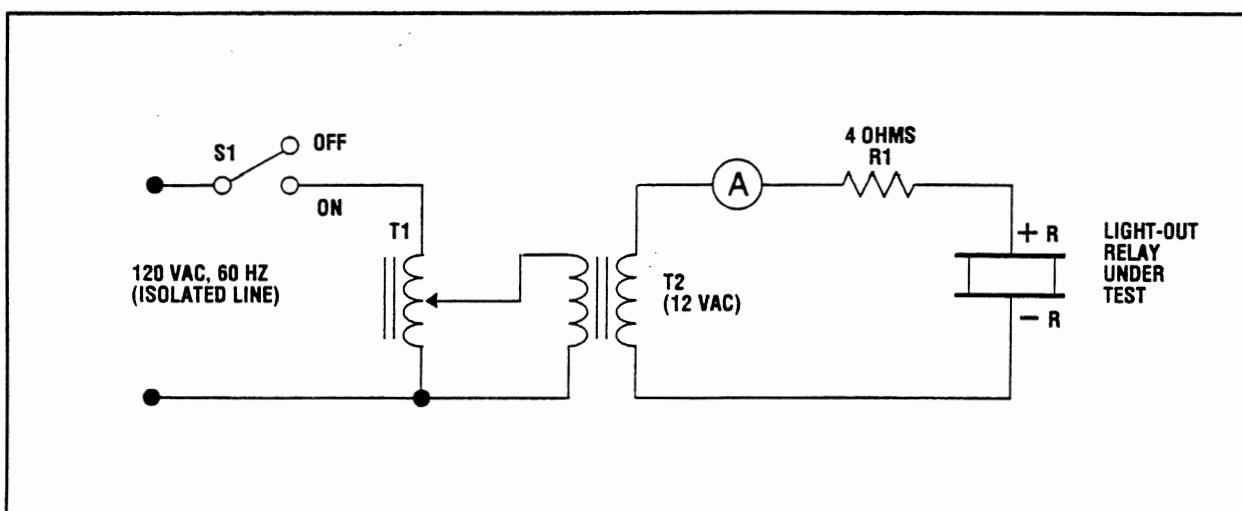


Figure 3-8. Lightout Relay, Test Setup

- e. Adjust Variac output control to Charge the relay until the ammeter indicates four times the Working value as specified on the relay's Application Information Sheet. The relay energizes.
- f. Reduce the Variac control setting until the front contacts open. Note the ammeter indication. It should be no less than specified on the relay's Application Information Sheet.
- g. Further reduce the Variac output to zero and then open the circuit momentarily.
- h. Increase the Variac output until the armature completes its pick-up motion and closes against the pole piece.
- i. Note the ammeter indication. It should be no greater than the Maximum Pick-up In-Service Application Limit specified on the relay's Application Information Sheet.

APPENDIX

APPLICATION INFORMATION SHEETS

A.1 INTRODUCTION

This Appendix contains PD-1 relay Application Information Sheets. Each Application Information Sheet contains the following information for its related PD-1 relay:

- a. Type of Relay
- b. Relay Part Number
- c. Quantity and Type of Contacts
- d. Relay Coil Resistance
- e. Plug Coupler Part Number and Type of Service (Front or Rear)
- f. Contact Data (Application, Max. Rating Volts, Max. Rating Amps)
- g. Operating Characteristics:
 - 1. Operating Parameters (Volts and Amps for Normal, Min. and Max.)
 - 2. Operating Time (Pick-Up and Release Times)
 - 3. Factory Standard Calibration Values (Drop-Away, Pick-Up, and Working)
 - 4. In-Service Application Limits (Pick-Up and Drop-Away)
 - 5. Operating Temperature Range
- h. Contacts Arrangement
- i. Notes

A.2 TYPES OF PD-1 RELAYS

This Appendix contains Application Information Sheets for the following types of PD-1 relays:

- a. Ordinary Acting, Biased Neutral, Low Voltage (Table A-1)
- b. Ordinary Acting, Biased Neutral, Low Voltage Front, Heavy Duty Back (Part No. 99255565)
- c. Ordinary Acting, Biased Neutral, Low Voltage, Car Carried (Part No. 99255675)
- d. Ordinary Acting, Biased Neutral, High Voltage Front, Low Voltage Back (Part No. 99260147)
- e. Ordinary Acting, Biased Neutral, High Voltage Front and Back (Part Nos. 99260389, 99260390, and 99260400)
- f. Slow Release, Biased Neutral, High Voltage (Part Nos. 99255103, 99260501, 99260502, and 99275882)
- g. Overload (Part Nos. 99275015 and 99275607)
- h. Flasher, Biased Neutral, Heavy Duty Front and Back (Part Nos. 99260389 and 99275037)
- i. Light Out, Biased Neutral, Low Voltage (Part Nos. 99275048 and 99275838)
- j. Magnetic Stick, Biased Neutral, Low Voltage (Part Nos. 99275070, 99275180, and 99275334)
- k. Power Off, Biased Neutral (Part Nos. 99260389 and 99275257)
- l. Magnetic Blow-Out, Biased Neutral (Part Number 99275860)

A.3 ABBREVIATIONS

The Abbreviations used on the Application Information Sheets are defined below:

ABBREVIATION	MEANING
AG	Silver
B	Back Contact
F	Front Contact
FB	Front-Back
H	Heel Contact
HD	Heavy Duty Contact
HV	High Voltage Contact
N	Normal Contact (Magnetic Stick Relay)
PO	Power Off
R	Reverse Contact (Magnetic Stick Relay)
S	Silver

UNION SWITCH & SIGNAL

Table A-1. Ordinary Acting, Biased Neutral,
Low Voltage PD-1 Relays

PART NO.	COIL OHMS	CONTACT QTY.	PLUG COUPLER TYPE	CONTACT TYPES
99255004	500	6FB	Front	F (Carbon Silver/Silver) B (Silver/Silver)
99255092	125	6FB	Rear	F (Carbon Silver/Silver) B (Silver/Silver)
99255114	500	6FB	Rear	F (Carbon Silver/Silver) B (Silver/Silver)
99255180	200	6FB	Rear	F (Carbon Silver/Silver) B (Silver/Silver)
99255290	200	6FB	Rear	F (Carbon Silver/Silver) B (Silver/Silver)
99255499	2.0	6FB	Front	F (Carbon Silver/Silver) B (Silver/Silver)
99255686	800	6FB	Rear	F (Carbon Silver/Silver) B (Silver/Silver)
99255719	3500	6FB	Rear	F (Carbon Silver/Silver) B (Silver/Silver)
99255893	500	6FB	Rear	F (Carbon Silver/Silver) B (Silver/Silver)

UNION SWITCH & SIGNAL

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RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Ord. Acting Biased Neutral, Low Volt.

RELAY PART NUMBER. 99255004 DRAWING NUMBER 5C559 REV-C INDEX H-L

QTY. AND TYPE OF CONTACTS: 6FB F(Carbon Silver to Silver) B(Silver to Silver)

RELAY COIL RESISTANCE. 500 OHMS, #30 WIRE SIZE, 13,000 TURNS.

REAR SERVICE _____ SHELF MOUNT _____
 PLUG COUPLER PART NO. FRONT SERVICE 74675035HL TRAIN CARRIED _____

CONTACT DATA

APPLICATION	<input checked="" type="checkbox"/> (S) SAFETY.	<input type="checkbox"/> (HD) HEAVY DUTY.	<input type="checkbox"/> (HV) HIGH VOLTAGE.
MAX. RATING VOLTS.	UP TO 30	UP TO 30	
MAX. RATING AMPS.	4	10	

OPERATING CHARACTERISTICS.

CONTACTS ARRANGEMENT AS VIEWED FROM REAR			
LEFT SIDE 500 Ohm RIGHT SIDE			
OPERATING PARAMETERS	<input type="checkbox"/> NORMAL <u>12.0</u> VDC _____ AMPS	<input type="checkbox"/> MIN. <u>6.5</u> VDC _____ AMPS	<input type="checkbox"/> MAX. <u>120</u> VDC _____ AMPS INTERMITTENT
			10 <u>6F (S)</u> <u>5H (S)</u>
OPERATING TIME AT NORMAL VOLTAGE	<input checked="" type="checkbox"/> PICK-UP <u>0.25</u> SECOND	<input type="checkbox"/> RELEASE <u>0.02</u> SECOND	8 <u>6H</u> <u>5H</u>
AMPS. <input type="checkbox"/>			7 <u>6B</u> <u>5B</u>
FACTORY STANDARD CALIBRATION VALUE	<input type="checkbox"/> DROP-AWAY <u>2.0</u> VDC _____ AMPS	<input type="checkbox"/> PICK-UP <u>6.5</u> VDC _____ AMPS	<input type="checkbox"/> WORKING <u>6.5</u> VDC _____ AMPS
		6 <u>4F (S)</u> <u>3F (S)</u>	5 <u>4H</u> <u>3H</u>
INSERVICE APPLICATION LIMITS.	<input type="checkbox"/> PICK-UP MAX. <u>7.15</u> VDC <u>0.0143</u> AMPS	<input type="checkbox"/> DROP-AWAY MIN. <u>1.34</u> VDC <u>0.0027</u> AMPS	4 <u>4B</u> <u>3B</u>
		3 <u>2F (S)</u> <u>1F (S)</u>	2 <u>2H</u> <u>1H</u>
OPERATING TEMPERATURE RANGE.	-40°F to +185°F.		
		1 <u>2B</u>	<u>1B</u>

NOTES

1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval.
2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factory standard calibration value.
3. Contact ampere rating is based on resistive loads only, derate 60% for inductive and 40% for motor load.

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Ord. Acting, Biased Neutral L.V.

RELAY PART NUMBER. 99255092 DRAWING NUMBER. SC503 REV.D COIL INDEX C-M

QTY. AND TYPE OF CONTACTS: 6FB F(Carbon Silver to Silver) B(Silver to Silver)

RELAY COIL RESISTANCE. 125 OHMS, 127 WIRE SIZE, 6,700 TURNS.

PLUG COUPLER PART NO. REAR SERVICE 74655002 CM SHELF MOUNT _____
 FRONT SERVICE _____ TRAIN CARRIED _____

CONTACT DATA

APPLICATION (S) SAFETY. (HD) HEAVY DUTY. (HV) HIGH VOLTAGE

MAX. RATING VOLTS. UP TO 30 UP TO 30

MAX. RATING AMPS. 4 10

OPERATING CHARACTERISTICS.

CONTACTS ARRANGEMENT AS VIEWED FROM REAR

OPERATING PARAMETERS	12.0			LEFT SIDE	RIGHT SIDE		
	3.0						
	120						
OPERATING TIME AT NORMAL VOLTAGE. <input checked="" type="checkbox"/> AMPS,	PICK-UP	0.07	SECOND	8	6H--		
	RELEASE	0.04	SECOND	7	6B--		
FACTORY STANDARD CALIBRATION VALUE.	DROP-AWAY	1.0	V. DC	6	4E (S)		
	PICK-UP	3.0	V. DC	5	4H--		
	WORKING	3.0	V. DC	4	4B--		
INSERVICE APPLICATION LIMITS.	PICK-UP MAX.	3.30	V. DC	3	2F (S)		
	DROP-AWAY MIN.	0.67	V. DC	2	2H--		
OPERATING TEMPERATURE RANGE.	-40° F TO +185° F.			1	2B--		

NOTES

1. THIS RELAY SHALL BE TESTED ON A PERIODIC BASIS, NOT EXCEEDING 2 YEARS OR CURRENT FRA-REQUIRED TESTING INTERVAL.
2. WHEN RELAY OPERATE OUT SIDE THE INSERVICE APPLICATION LIMITS VALUE, IT SHALL BE RECONDITIONED AS PER PD-1 RELAY SHOPPING PROCEDURE AND CALIBRATE TO FACTORY STANDARD CALIBRATION VALUE.
3. CONTACT AMPERE RATING IS BASED ON RESISTIVE LOADS ONLY, DERATE 60% FOR INDUCTIVE AND 40% FOR MOTOR LOAD.

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Slow Release Biased Neutral Low Volt.

RELAY PART NUMBER. 99255103 DRAWING NUMBER SC506 REV-E INDEX B-E

QTY. AND TYPE OF CONTACTS: 6FB F(Carbon Silver to Silver) B(Silver to Silver)

RELAY COIL RESISTANCE. 200 OHMS, #29 WIRE SIZE, 6,500 TURNS.

PLUG COUPLER PART NO. REAR SERVICE 74655002 SHELF MOUNT _____
 FRONT SERVICE _____ TRAIN CARRIED _____

CONTACT DATA

APPLICATION	<input checked="" type="checkbox"/> (S) SAFETY.	<input type="checkbox"/> (HD) HEAVY DUTY.	<input type="checkbox"/> (HV) HIGH VOLTAGE.
MAX. RATING VOLTS.	UP TO 30	UP TO 30	
MAX. RATING AMPS.	4	10	

OPERATING CHARACTERISTICS.

CONTACTS ARRANGEMENT AS VIEWED FROM REAR			
LEFT SIDE 200 Ohm RIGHT SIDE			
OPERATING PARAMETERS	<input checked="" type="checkbox"/> NORMAL <u>12.0</u> VDC	_____ AMPS	
	<input type="checkbox"/> MIN. <u>6.5</u> VDC	_____ AMPS	10 <u>(-)COIL</u>  <u>(+)COIL</u>
	<input type="checkbox"/> MAX. <u>120</u> VDC	_____ AMPS	9 <u>6F (S)</u> <u>5F (S)</u>
OPERATING TIME AT NORMAL VOLTAGE <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> PICK-UP <u>0.35</u> SECOND	8 <u>6H</u>	<u>5H</u>
AMPS. <input type="checkbox"/>	<input type="checkbox"/> RELEASE <u>0.9</u> SECOND at 12V	7 <u>6B</u>	<u>5B</u>
FACTORY STANDARD CALIBRATION VALUE	<input type="checkbox"/> DROP-AWAY <u>2.0</u> VDC	6 <u>4F (S)</u>	<u>3F (S)</u>
	<input type="checkbox"/> PICK-UP <u>6.5</u> VDC	5 <u>4H</u>	<u>3H</u>
	<input type="checkbox"/> WORKING <u>6.5</u> VDC	4 <u>4B</u>	<u>3B</u>
INSERVICE APPLICATION LIMITS.	<input type="checkbox"/> PICK-UP MAX. <u>7.15</u> VDC <u>0.036</u> AMPS	3 <u>2F (S)</u>	<u>1F (S)</u>
	<input type="checkbox"/> DROP-AWAY MIN. <u>1.34</u> VDC <u>0.067</u> AMPS	2 <u>2H</u>	<u>1H</u>
OPERATING TEMPERATURE RANGE.	-40°F to +185°F.	1 <u>2B</u>	<u>1B</u>

NOTES

1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval.
2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factory standard calibration value.
3. Contact ampere rating is based on resistive loads only, derate 60% for inductive and 40% for motor load.

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Ord. Acting Biased Neutral, Low Volt.

RELAY PART NUMBER. 99255114 DRAWING NUMBER 5C507 REV-F COIL INDEX H-L

QTY. AND TYPE OF CONTACTS: 6FB F(Carbon Silver to Silver) 8(Silver to Silver)

RELAY COIL RESISTANCE. 500 OHMS, #30 WIRE SIZE, 13,000 TURNS.

REAR SERVICE 74655002HL SHELF MOUNT _____
PLUG COUPLER PART NO. FRONT SERVICE _____ TRAIN CARRIED _____

CONTACT DATA

APPLICATION	<input checked="" type="checkbox"/> (S) SAFETY.	<input type="checkbox"/> (HD) HEAVY DUTY.	<input type="checkbox"/> (HV) HIGH VOLTAGE.
MAX. RATING VOLTS.	UP TO 30	UP TO 30	
MAX. RATING AMPS.	4	10	

OPERATING CHARACTERISTICS.

CONTACTS ARRANGEMENT AS VIEWED FROM REAR			
LEFT SIDE 500 Ohm RIGHT SIDE			
OPERATING PARAMETERS	<input checked="" type="checkbox"/> NORMAL <u>12.0</u> VDC	_____ AMPS	
	<input type="checkbox"/> MIN. <u>6.5</u> VDC	_____ AMPS	10 <u>(-)COIL</u> <u>(+)COIL</u>
	<input type="checkbox"/> MAX. <u>120</u> VDC	_____ AMPS	9 <u>6F (S)</u> <u>5H (S)</u>
OPERATING TIME AT NORMAL VOLTAGE [X] AMPS. []	<input checked="" type="checkbox"/> PICK-UP <u>0.25</u> SECOND		8 <u>6H</u> <u>5H</u>
	<input type="checkbox"/> RELEASE <u>0.02</u> SECOND		7 <u>6B</u> <u>5B</u>
FACTORY STANDARD CALIBRATION VALUE	<input type="checkbox"/> DROP-AWAY <u>2.0</u> VDC	_____ AMPS	6 <u>4F (S)</u> <u>3F (S)</u>
	<input type="checkbox"/> PICK-UP <u>6.5</u> VDC	_____ AMPS	5 <u>4H</u> <u>3H</u>
	<input type="checkbox"/> WORKING <u>6.5</u> VDC	_____ AMPS	4 <u>4B</u> <u>3B</u>
INSERVICE APPLICATION LIMITS.	<input type="checkbox"/> PICK-UP MAX. <u>7.15</u> VDC <u>0.0143</u> AMPS		3 <u>2F (S)</u> <u>1F (S)</u>
	<input type="checkbox"/> DROP-AWAY MIN. <u>1.34</u> VDC <u>0.0027</u> AMPS		2 <u>2H</u> <u>1H</u>
OPERATING TEMPERATURE RANGE.	<u>-40°F to +185°F.</u>		1 <u>2B</u> <u>1B</u>

NOTES

1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval.
2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factory standard calibration value.
3. Contact ampere rating is based on resistive loads only, derate 60% for inductive and 40% for motor load.

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Slow Pick-Up Biased, Neutral Low Volt.

RELAY PART NUMBER. 99255180 DRAWING NUMBER SC513 REV-B COIL INDEX G-L

QTY. AND TYPE OF CONTACTS: 6FB F(Carbon Silver to Silver) B(Silver to Silver)

RELAY COIL RESISTANCE. 200 OHMS, #29 WIRE SIZE, 6,500 TURNS.

PLUG COUPLER PART NO. REAR SERVICE _____ SHELF MOUNT _____
 FRONT SERVICE _____ TRAIN CARRIED _____

CONTACT DATA

APPLICATION	<input checked="" type="checkbox"/> (S) SAFETY.	<input type="checkbox"/> (HD) HEAVY DUTY.	<input type="checkbox"/> (HV) HIGH VOLTAGE.
MAX. RATING VOLTS.	UP TO 30	UP TO 30	
MAX. RATING AMPS.	4	10	

OPERATING CHARACTERISTICS.

OPERATING PARAMETERS	CONTACTS ARRANGEMENT		
	AS VIEWED FROM REAR		
	LEFT SIDE	200 Ohm	RIGHT SID.
MIN. <u>9.0</u> VDC	AMPS	10	(-)COIL (+)COIL
MAX. <u>120</u> VDC	AMPS INTERMITTENT	9	<u>6F (S)</u> <u>5F (S)</u>
PICK-UP <u>0.75</u> SECOND		8	<u>6H</u> <u>5H</u>
RELEASE <u>0.17</u> SECOND		7	<u>6B</u> <u>5B</u>
DROP-AWAY <u>3.50</u> VDC	AMPS	6	<u>4F (S)</u> <u>3F (S)</u>
PICK-UP <u>9.00</u> VDC	AMPS	5	<u>4H</u> <u>3H</u>
WORKING <u>9.00</u> VDC	AMPS	4	<u>4B</u> <u>3B</u>
PICK-UP MAX. <u>9.90</u> VDC <u>0.049</u> AMPS		3	<u>2F (S)</u> <u>1F (S)</u>
DROP-AWAY MIN. <u>2.34</u> VDC <u>0.011</u> AMPS		2	<u>2H</u> <u>1H</u>
OPERATING TEMPERATURE RANGE.	-40°F to +185°F.	1	<u>2B</u> <u>1B</u>

NOTES

1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval.
2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factory standard calibration value.
3. Contact ampere rating is based on resistive loads only, derate 60% for inductive and 40% for motor load.

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Slow Pick-Up Biased, Neutral Low Volt.

RELAY PART NUMBER. 99255290 DRAWING NUMBER 5C523 REV-E COIL INDEX G-L

QTY. AND TYPE OF CONTACTS: 6FB F(Carbon Silver to Silver) B(Silver to Silver)

RELAY COIL RESISTANCE. 200 OHMS, #29 WIRE SIZE, 6,500 TURNS.

REAR SERVICE 74655002 SHELF MOUNT _____

PLUG COUPLER PART NO. _____

FRONT SERVICE _____ TRAIN CARRIED _____

CONTACT DATA

APPLICATION	<input checked="" type="checkbox"/> (S) SAFETY.	<input type="checkbox"/> (HD) HEAVY DUTY.	<input type="checkbox"/> (HV) HIGH VOLTAGE.
MAX. RATING VOLTS.	UP TO 30	UP TO 30	
MAX. RATING AMPS.	4	10	

OPERATING CHARACTERISTICS.

OPERATING CHARACTERISTICS.				CONTACTS ARRANGEMENT AS VIEWED FROM REAR	
OPERATING PARAMETERS				LEFT SIDE 200 Ohm RIGHT SIDE	
	{ NORMAL <u>12.0</u> VDC	_____	AMPS		
	{ MIN. <u>9.0</u> VDC	_____	AMPS	10	(-)COIL  (+)COIL
	{ MAX. <u>120</u> VDC	_____	AMPS INTERMITTENT	9	<u>6F (S)</u> <u>5F (S)</u>
OPERATING TIME AT NORMAL VOLTAGE <input checked="" type="checkbox"/>	{ PICK-UP <u>1.30</u> SECOND	_____		8	<u>6H</u> <u>5H</u>
AMPS. <input type="checkbox"/>	{ RELEASE <u>0.60</u> SECOND	_____		7	<u>6B</u> <u>5B</u>
FACTORY STANDARD CALIBRATION VALUE				{	
	DROP-AWAY <u>3.5</u> VDC	_____	AMPS	6	<u>4F (S)</u> <u>3F (S)</u>
	{ PICK-UP <u>9.0</u> VDC	_____	AMPS	5	<u>4H</u> <u>3H</u>
	{ WORKING <u>9.0</u> VDC	_____	AMPS	4	<u>4B</u> <u>3B</u>
INSERVICE APPLICATION LIMITS.				{	
	PICK-UP MAX. <u>9.90</u> VDC	<u>0.0495</u> AMPS		3	<u>2F (S)</u> <u>1F (S)</u>
	{ DROP-AWAY MIN. <u>2.33</u> VDC	<u>0.0116</u> AMPS		2	<u>2H</u> <u>1H</u>
OPERATING TEMPERATURE RANGE.					
	<u>-40°F to +185°F.</u>			1	<u>2B</u> <u>1B</u>

NOTES

1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval.
2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factory standard calibration value.
3. Contact ampere rating is based on resistive loads only, derate 60% for inductive and 40% for motor load.

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Ord. Acting, Biased Neutral, Low Volt.

RELAY PART NUMBER. 99255499 DRAWING NUMBER 5C534

QTY. AND TYPE OF CONTACTS: 6FB F(Carbon Silver to Silver) B(Silver to Silver)

RELAY COIL RESISTANCE. 2.0 OHMS, #18 WIRE SIZE, 925 TURNS.

[] REAR SERVICE _____ [] SHELF MOUNT _____
 PLUG COUPLER PART NO. [X] FRONT SERVICE 74675068 [] TRAIN CARRIED _____

CONTACT DATA

APPLICATION	[X] (S) SAFETY.	[] (HD) HEAVY DUTY.	[] (HV) HIGH VOLTAGE.
MAX. RATING VOLTS.	UP TO 30	UP TO 30	
MAX. RATING AMPS.	4	10	

OPERATING CHARACTERISTICS.

CONTACTS ARRANGEMENT AS VIEWED FROM REAR			
OPERATING PARAMETERS	{ NORMAL ____ VDC <u>0.680</u> AMPS	LEFT SIDE 2.0 Ohm	RIGHT SIDE
	{ MIN. ____ VDC <u>0.170</u> AMPS	10	(-)COIL <u> </u> (+)COIL
	{ MAX. ____ VDC <u>1.70</u> AMPS INTERMITTENT	9	<u>6F (S)</u> <u>5H (S)</u>
OPERATING TIME AT NORMAL VOLTAGE [] AMPS. [X]	{ PICK-UP <u>0.25</u> SECOND	8	<u>6H</u> <u>5H</u>
	{ RELEASE <u>0.025</u> SECOND	7	<u>6B</u> <u>5B</u>
FACTORY STANDARD CALIBRATION VALUE	{ DROP-AWAY ____ VDC <u>0.057</u> AMPS	6	<u>4F (S)</u> <u>3F (S)</u>
	{ PICK-UP ____ VDC <u>0.170</u> AMPS	5	<u>4H</u> <u>3H</u>
	{ WORKING ____ VDC <u>0.170</u> AMPS	4	<u>4B</u> <u>3B</u>
INSERVICE APPLICATION LIMITS.	{ PICK-UP MAX. <u>0.374</u> VDC <u>0.187</u> AMPS	3	<u>2F (S)</u> <u>1F (S)</u>
	{ DROP-AWAY MIN. <u>0.076</u> VDC <u>0.038</u> AMPS	2	<u>2H</u> <u>1H</u>
OPERATING TEMPERATURE RANGE.	-40°F to +185°F.	1	<u>2B</u> <u>1B</u>

NOTES

1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval.
2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factory standard calibration value.
3. Contact ampere rating is based on resistive loads only, derate 60% for inductive and 40% for motor load.

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Ord. Acting, Biased Neutral, W/Low Volt Front & H.D. Back.

RELAY PART NUMBER. 99255565 DRAWING NUMBER 5C532 REV-C

QTY. AND TYPE OF CONTACTS: 6FB F(Carbon Silver to Silver) BHD(Silver to Silver)

RELAY COIL RESISTANCE. 500 OHMS, #30 WIRE SIZE, 13,000 TURNS.

[] REAR SERVICE _____ [] SHELF MOUNT _____
 PLUG COUPLER PART NO. (X) FRONT SERVICE 74675321 [] TRAIN CARRIED _____

CONTACT DATA

APPLICATION	<input checked="" type="checkbox"/> (S) SAFETY.	<input type="checkbox"/> (HD) HEAVY DUTY.	<input type="checkbox"/> (HV) HIGH VOLTAGE.
MAX. RATING VOLTS.	UP TO 30	UP TO 30	
MAX. RATING AMPS.	4	10	

OPERATING CHARACTERISTICS.

OPERATING PARAMETERS	CONTACTS ARRANGEMENT AS VIEWED FROM REAR		
	LEFT SIDE 500 ohm RIGHT SIDE		
	10	(-)COIL	(+)COIL
OPERATING TIME AT NORMAL VOLTAGE <u>(X)</u> AMPS. <input type="checkbox"/>	PICK-UP <u>0.25</u> SECOND	8	<u>6H</u> <u>5H</u>
	RELEASE <u>0.02</u> SECOND	7	<u>6B (HD)</u> <u>5B (HD)</u>
FACTORY STANDARD CALIBRATION VALUE	DROP-AWAY <u>2.0</u> VDC <u>AMPS</u>	6	<u>4F (S)</u> <u>3F (S)</u>
	PICK-UP <u>6.50</u> VDC <u>AMPS</u>	5	<u>4H</u> <u>3H</u>
INSERVICE APPLICATION LIMITS.	WORKING <u>6.50</u> VDC <u>AMPS</u>	4	<u>4B (HD)</u> <u>3B (HD)</u>
	PICK-UP MAX. <u>7.15</u> VDC <u>.0143</u> AMPS	3	<u>2F (S)</u> <u>1F (S)</u>
	DROP-AWAY MIN. <u>1.33</u> VDC <u>.0026</u> AMPS	2	<u>2H</u> <u>1H</u>
OPERATING TEMPERATURE RANGE.	-40°F to +185°F.	1	<u>2B (HD)</u> <u>1B (HD)</u>

NOTES

1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval.
2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factory standard calibration value.
3. Contact ampere rating is based on resistive loads only, derate 60% for inductive and 40% for motor load.

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Flasher, Biased Neutral, W/Heavy Duty Front & Back.

RELAY PART NUMBER. 99255664 DRAWING NUMBER 5C526 CODE INDEX C-E

QTY. AND TYPE OF CONTACTS: 6FB F&B HD(Silver to Silver)

RELAY COIL RESISTANCE. 125 OHMS, #27 WIRE SIZE, 6,700 TURNS.

REAR SERVICE 74655026 SHELF MOUNT _____

PLUG COUPLER PART NO. _____

FRONT SERVICE _____ TRAIN CARRIED _____

CONTACT DATA

APPLICATION	<input type="checkbox"/> (S) SAFETY.	<input checked="" type="checkbox"/> (HD) HEAVY DUTY.	<input type="checkbox"/> (HV) HIGH VOLTAGE.
MAX. RATING VOLTS.	UP TO 30	UP TO 30	
MAX. RATING AMPS.	4	10	

OPERATING CHARACTERISTICS.

OPERATING PARAMETERS	CONTACTS ARRANGEMENT AS VIEWED FROM REAR		
	LEFT SIDE 125 Ohm RIGHT SIDE		
	MIN.	12.0 VDC	AMPS
	MAX. <u>120</u> VDC		AMPS INTERMITTENT
	9	<u>6F (HD)</u>	<u>5H (HD)</u>
OPERATING TIME AT NORMAL VOLTAGE <input checked="" type="checkbox"/>	PICK-UP <u>0.07</u> SECOND		8 <u>6H</u> <u>5H</u>
AMPS. <input type="checkbox"/>	RELEASE <u>0.04</u> SECOND		7 <u>6B (HD)</u> <u>5B (HD)</u>
FACTORY STANDARD CALIBRATION VALUE	DROP-AWAY <u>1.0</u> VDC	AMPS	6 <u>4F (HD)</u> <u>3F (HD)</u>
INSERVICE APPLICATION LIMITS.	PICK-UP <u>3.0</u> VDC	AMPS	5 <u>4H</u> <u>3H</u>
	WORKING <u>3.0</u> VDC	AMPS	4 <u>4B (HD)</u> <u>3B (HD)</u>
	PICK-UP MAX. <u>3.30</u> VDC	<u>.0264</u> AMPS	3 <u>2F (HD)</u> <u>1F (HD)</u>
	DROP-AWAY MIN. <u>0.67</u> VDC	<u>.0053</u> AMPS	2 <u>2H</u> <u>1H</u>
OPERATING TEMPERATURE RANGE.	-40°F to +185°F.		1 <u>2B (HD)</u> <u>1B (HD)</u>

NOTES

1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval.
2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factory standard calibration value.
3. Contact ampere rating is based on resistive loads only, derate 60% for inductive and 40% for motor load.
4. When this relay is used with Transcontrol Relay Driver Style (F.R.D.) Part No. 75335009, it will provide 43-2 flashes per minute, starting at 10 VDC.

*This relay can be replaced by P/N 99260389

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Ord. Acting, Biased Neutral, Low Volt

RELAY PART NUMBER. 99255675 DRAWING NUMBER 5C530

QTY. AND TYPE OF CONTACTS: 6FB F(Carbon Silver to Silver) B(Silver to Silver)

RELAY COIL RESISTANCE. 3500 OHMS, #34 WIRE SIZE, 35,000 TURNS.

[] REAR SERVICE _____ [] SHELF MOUNT _____
 PLUG COUPLER PART NO. [] FRONT SERVICE _____ [] TRAIN CARRIED _____
 [X] (No plug coupler is used on Train carried Relay)

CONTACT DATA

APPLICATION	[X] (S) SAFETY.	[] (HD) HEAVY DUTY.	[] (HV) HIGH VOLTAGE.
MAX. RATING VOLTS.	UP TO 30	UP TO 30	
MAX. RATING AMPS.	4	10	

OPERATING CHARACTERISTICS.

CONTACTS ARRANGEMENT AS VIEWED FROM REAR			
LEFT SIDE		RIGHT SIDE	
OPERATING	NORMAL <u>28.0</u> VDC	AMPS	3500 Ohm
PARAMETERS	MIN. <u>17.0</u> VDC	AMPS	10 (-)COIL (+)COIL
	MAX. <u>280</u> VDC	AMPS INTERMITTENT	9 <u>6F (S)</u>  <u>5F (S)</u> 12K, 2W
OPERATING TIME AT	PICK-UP <u>0.25</u> SECOND		8. <u>6H</u> <u>5H</u>
NORMAL VOLTAGE []	RELEASE <u>0.02</u> SECOND		7. <u>6B</u> <u>5B</u>
AMPS. []			
FACTORY STANDARD	DROP-AWAY <u>5.25</u> VDC	AMPS	6 <u>4F (S)</u> <u>3F (S)</u>
CALIBRATION VALUE	PICK-UP <u>17.0</u> VDC	AMPS	5 <u>4H</u> <u>3H</u>
	WORKING <u>17.0</u> VDC	AMPS	4 <u>4B</u> <u>3B</u>
INSERVICE APPLICATION	PICK-UP MAX. <u>18.70</u> VDC	<u>.005</u> AMPS	3 <u>2F (S)</u> <u>1F (S)</u>
LIMITS.	DROP-AWAY MIN. <u>3.51</u> VDC	<u>.001</u> AMPS	2 <u>2H</u> <u>1H</u>
OPERATING TEMPERATURE RANGE.	-40°F to +185°F.		1 <u>2B</u> <u>1B</u>

NOTES

1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval.
2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factory standard calibration value.
3. Contact ampere rating is based on resistive loads only, derate 60% for inductive and 40% for motor load.
4. All calculations are based on 3,500 Ohm coil.
5. 12K, 2 Watts resistor is connected in parallel to coil.

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Ord. Acting, Biased Neutral, Low Volt

RELAY PART NUMBER. 99255686 DRAWING NUMBER 5C531

QTY. AND TYPE OF CONTACTS: 6FB F(Carbon Silver to Silver) B(Silver to Silver)

RELAY COIL RESISTANCE. 800 OHMS, #31 WIRE SIZE, 17,500 TURNS.

REAR SERVICE 74655002 SHELF MOUNT _____
PLUG COUPLER PART NO. FRONT SERVICE _____ TRAIN CARRIED _____

CONTACT DATA

APPLICATION	<input checked="" type="checkbox"/> (S) SAFETY.	<input type="checkbox"/> (HD) HEAVY DUTY.	<input type="checkbox"/> (HV) HIGH VOLTAGE.
MAX. RATING VOLTS.	UP TO 30	UP TO 30	
MAX. RATING AMPS.	4	10	

OPERATING CHARACTERISTICS.

CONTACTS ARRANGEMENT AS VIEWED FROM REAR			
		LEFT SIDE	RIGHT SIDE
OPERATING PARAMETERS	<input checked="" type="checkbox"/> NORMAL <u>12.0</u> VDC _____ AMPS		800 Ohm 10 (-)COIL <u>(+)</u> COIL
	<input type="checkbox"/> MIN. <u>8.0</u> VDC _____ AMPS	9	<u>6F (S)</u> <u>5H (S)</u>
	<input type="checkbox"/> MAX. <u>120</u> VDC _____ AMPS INTERMITTENT	8	<u>6H</u> <u>5H</u>
OPERATING TIME AT NORMAL VOLTAGE <input checked="" type="checkbox"/>	<input type="checkbox"/> PICK-UP <u>0.30</u> SECOND	7	<u>6B</u> <u>5B</u>
AMPS. <input type="checkbox"/>	<input type="checkbox"/> RELEASE <u>0.02</u> SECOND	6	<u>4F (S)</u> <u>3H</u>
FACTORY STANDARD CALIBRATION VALUE	<input type="checkbox"/> DROP-AWAY <u>2.40</u> VDC _____ AMPS	5	<u>4H</u> <u>3H</u>
	<input type="checkbox"/> PICK-UP <u>8.0</u> VDC _____ AMPS	4	<u>4B</u> <u>4B</u>
INSERVICE APPLICATION LIMITS.	<input type="checkbox"/> WORKING <u>8.0</u> VDC _____ AMPS	3	<u>2F (S)</u> <u>1F (S)</u>
	<input type="checkbox"/> PICK-UP MAX. <u>8.80</u> VDC <u>.011</u> AMPS	2	<u>2H</u> <u>1H</u>
	<input type="checkbox"/> DROP-AWAY MIN. <u>1.60</u> VDC <u>.002</u> AMPS	1	<u>2B</u> <u>1B</u>

OPERATING TEMPERATURE RANGE. -40°F to +185°F.

NOTES

1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval.
2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factory standard calibration value.
3. Contact ampere rating is based on resistive loads only, derate 60% for inductive and 40% for motor load.

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Ord. Acting, Biased Neutral, Low Volt

RELAY PART NUMBER. 99255719 DRAWING NUMBER 5C541

QTY. AND TYPE OF CONTACTS: 6FB F(Carbon Silver to Silver) B(Silver to Silver)

RELAY COIL RESISTANCE. 3500 OHMS, #34 WIRE SIZE, 35,000 TURNS.

PLUG COUPLER PART NO. REAR SERVICE _____ SHELF MOUNT _____
 FRONT SERVICE _____ TRAIN CARRIED 74675211
W/Bracket

CONTACT DATA

OPERATING CHARACTERISTICS.

		AS VIEWED FROM REAR	
		LEFT SIDE	RIGHT SIDE
OPERATING PARAMETERS	NORMAL <u>28.0</u> VDC	AMPS	3500 Ohm
	MIN. <u>17.0</u> VDC	AMPS	10 (-) COIL (+) COIL
	MAX. <u>280</u> VDC	AMPS INTERMITTENT	9 <u>6F (S)</u> <u>5F (S)</u>
OPERATING TIME AT NORMAL VOLTAGE (X) AMPS. []	PICK-UP <u>0.25</u> SECOND		8 <u>6H</u> <u>5H</u>
	RELEASE <u>0.02</u> SECOND		7 <u>6B</u> <u>5B</u>
	DROP-AWAY <u>5.25</u> VDC	AMPS	6 <u>4F (S)</u> <u>3F (S)</u>
FACTORY STANDARD CALIBRATION VALUE	PICK-UP <u>17.0</u> VDC	AMPS	5 <u>4H</u> <u>3H</u>
	WORKING <u>17.0</u> VDC	AMPS	4 <u>4B</u> <u>3B</u>
INSERVICE APPLICATION LIMITS.	PICK-UP MAX. <u>18.70</u> VDC	<u>.0053</u> AMPS	3 <u>2F (S)</u> <u>1F (S)</u>
	DROP-AWAY MIN. <u>3.51</u> VDC	<u>.001</u> AMPS	2 <u>2H</u> <u>1H</u>
OPERATING TEMPERATURE RANGE.		-40°F to +185°F.	1 2B 1B

NOTES

1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval.
2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factory standard calibration value.
3. Contact ampere rating is based on resistive loads only, derate 60% for inductive and 40% for motor load.

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Ord. Acting Biased Neutral, Low Volt.

RELAY PART NUMBER. 99260147 DRAWING NUMBER 5C596 REV-A INDEX CODE H-L

QTY. AND TYPE OF CONTACTS: 6FB F(Silver Graphite to Silver) 8(Silver to Silver)

RELAY COIL RESISTANCE. 500 OHMS, #30 WIRE SIZE, 13,000 TURNS.

REAR SERVICE 74655002HL SHELF MOUNT _____
PLUG COUPLER PART NO. _____

FRONT SERVICE _____ TRAIN CARRIED _____

CONTACT DATA

	FRONT CONTACTS	FRONT CONTACTS (HV-S)
APPLICATION	<input type="checkbox"/> (S) SAFETY. <input type="checkbox"/> (HD) HEAVY DUTY. <input checked="" type="checkbox"/> (HV) HIGH VOLTAGE.	
MAX. RATING VOLTS.	UP TO 30	UP TO 30
MAX. RATING AMPS.	4	10

50VDC/110V AC 15A

OPERATING CHARACTERISTICS.

CONTACTS ARRANGEMENT AS VIEWED FROM REAR			
	LEFT SIDE	RIGHT SIDE	---
OPERATING PARAMETERS	NORMAL <u>12.0</u> VDC _____ AMPS		
	MIN. <u>6.5</u> VDC _____ AMPS	10	(-)COIL <u>+</u> COIL
	MAX. <u>120</u> VDC _____ AMPS INTERMITTENT	9	<u>6F HV-S</u> <u>5F HV-S</u>
OPERATING TIME AT NORMAL VOLTAGE <input checked="" type="checkbox"/> AMPS. <input type="checkbox"/>	PICK-UP <u>0.25</u> SECOND	8	<u>6H</u> <u>5H</u>
	RELEASE <u>0.02</u> SECOND	7	<u>6B</u> <u>5B</u>
FACTORY STANDARD CALIBRATION VALUE	DROP-AWAY <u>2.0</u> VDC _____ AMPS	6	<u>4F HV-S</u> <u>3F HV-S</u>
	PICK-UP <u>6.5</u> VDC _____ AMPS	5	<u>4H</u> <u>3H</u>
	WORKING <u>6.5</u> VDC _____ AMPS	4	<u>4B</u> <u>3B</u>
INSERVICE APPLICATION LIMITS.	PICK-UP MAX. <u>7.15</u> VDC <u>.0143</u> AMPS	3	<u>2F HV-S</u> <u>1F HV-S</u>
	DROP-AWAY MIN. <u>1.34</u> VDC <u>.0027</u> AMPS	2	<u>2H</u> <u>1H</u>
OPERATING TEMPERATURE RANGE.	-40°F to +185°F.	1	<u>2B</u> <u>1B</u>

NOTES

1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval.
2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factory standard calibration value.
3. Contact ampere rating is based on resistive loads only, derate 60% for inductive and 40% for motor load.

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Ord. Acting, Biased Neutral, HV-S

RELAY PART NUMBER. 99260389 DRAWING NUMBER 5C641 REV-d COIL INDEX A-7

QTY. AND TYPE OF CONTACTS: 6FB F&B(Silver Graphite to Silver) HV

RELAY COIL RESISTANCE. 125 OHMS, #27 WIRE SIZE, 6,700 TURNS.

CONTACT DATA

APPLICATION (S) SAFETY. (HD) HEAVY DUTY. (HV) HIGH VOLTAGE.
MAX. RATING VOLTS. UP TO 30 UP TO 30 SAFETY UP TO 50 DC/110V AC
MAX. RATING AMPS. 4 10 15

OPERATING CHARACTERISTICS.

CONTACTS ARRANGEMENT

AS VIEWED FROM REAR

OPERATING PARAMETERS { MIN. 3.0 VDC _____ AMPS 10 (-)COIL  (+)COIL
MAX. 120 VDC _____ AMPS INTERMITTENT 9 5E HV-S 5E HV-S

OPERATING TIME AT
NORMAL VOLTAGE [X] } PICK-UP 0.07 SECOND 8 6H 5H
AMPS. [] } RELEASE 0.04 SECOND 7 6B HV-S 5B HV-S

FACTORY STANDARD	DROP-AWAY	1.0	VDC	_____	AMPS	6	4F HV-S	3F HV-S
	PICK-UP	3.0	VDC	_____	AMPS	5	4H	3H

INSERVICE APPLICATION WORKING 3.0 VDC _____ AMPS 4 4B HV-S 3B HV-S
 PICK-UP MAX. 3.30 VDC 0.026 AMPS 3 2F HV-S 1F HV-S

INSERVICE APPLICATION
LIMITS. } PICK-UP MAX. 3.30 VDC 0.026 AMPS 3 2F HV-S 1F HV-S
} DROP-AWAY MIN. 0.67 VDC 0.005 AMPS 2 2H 1H

1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval.
2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factor standard calibration value.
3. Contact ampere rating is based on resistive loads only, derate 60% for inductive and 40% for motor load.
4. -Relay used with PO. Rectifier Unit #7880588 has Plug Coupler #74655123. As Power Off/W Rectifier, Relay operates @ 6/7VAC Drop-Away & 9VAC Pick-Up & Work.
-Relay used W/Flasher Relay Driver(FRD) #75335009 has Plug Coupler#74655123. As Flasher Relay it provides 43 ± 2 Flashes/Min, starting @ 10VDC.
-Relay used alone as Line Relay has Plug Coupler #74655002.

RELAY ENGINEERING APPLICATION INFORMATION SHEET
THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Ord. Acting Biased Neutral, HV-S

RELAY PART NUMBER. 99260390 DRAWING NUMBER _____ COIL INDEX C-3

QTY. AND TYPE OF CONTACTS: 6FB F&B(Silver to Silver) HD

RELAY COIL RESISTANCE. 125 OHMS, #27 WIRE SIZE, 6,700 TURNS.

REAR SERVICE *SEE NOTE (4) SHELF MOUNT _____
PLUG COUPLER PART NO. FRONT SERVICE TRAIN CARRIED _____

CONTACT DATA

APPLICATION	<input type="checkbox"/> (S) SAFETY.	<input checked="" type="checkbox"/> (HD) HEAVY DUTY.	<input type="checkbox"/> (HV) HIGH VOLTAGE.
MAX. RATING VOLTS.	UP TO 30	UP TO 30	SAFETY UP TO 50 DC/110V AC
MAX. RATING AMPS.	4	10	15

OPERATING CHARACTERISTICS.

CONTACTS ARRANGEMENT
AS VIEWED FROM REAR
LEFT SIDE 125 Ohm RIGHT SIDE

OPERATING PARAMETERS	NORMAL <u>12.0</u> VDC _____ AMPS			10 <u>(-)COIL</u>  <u>(+)COIL</u>	
	MIN. <u>3.0</u> VDC _____ AMPS				
	MAX. <u>120</u> VDC _____ AMPS INTERMITTENT				
OPERATING TIME AT NORMAL VOLTAGE <u>(X)</u> AMPS. <input type="checkbox"/>	PICK-UP <u>0.07</u> SECOND			8 <u>6H</u> <u>5H</u>	
	RELEASE <u>0.04</u> SECOND			7 <u>6B (HD)</u> <u>5B (HD)</u>	
FACTORY STANDARD CALIBRATION VALUE	DROP-AWAY	<u>1.0</u> VDC	AMPS	6 <u>4F (HD)</u> <u>3F (HD)</u>	
	PICK-UP	<u>3.0</u> VDC	AMPS	5 <u>4H</u> <u>3H</u>	
	WORKING	<u>3.0</u> VDC	AMPS	4 <u>4B (HD)</u> <u>3B (HD)</u>	
INSERVICE APPLICATION LIMITS.	PICK-UP MAX.	<u>3.30</u> VDC	<u>0.026</u> AMPS	3 <u>2F (HD)</u> <u>1F (HD)</u>	
	DROP-AWAY MIN.	<u>0.67</u> VDC	<u>0.005</u> AMPS	2 <u>2H</u> <u>1H</u>	
OPERATING TEMPERATURE RANGE.	<u>-40°F</u> to <u>+185°F</u> .			1 <u>2B (HD)</u> <u>1B (HD)</u>	

NOTES

1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval.
2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factory standard calibration value.
3. Contact ampere rating is based on resistive loads only, derate 60% for inductive and 40% for motor load.
4. -Relay used with PO. Rectifier Unit #7880588 has Plug Coupler #74655123C3. As Power Off/W Rectifier, Relay operates @ 6/7VAC Drop-Away & 9VAC Pick-Up & Work.
-Relay used W/Flasher Relay Driver(FRD) #75335009 has Plug Coupler #74655123C3. As Flasher Relay it provides 43 ± 2 Flashes/Min, starting @ 10VDC.

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Ord. Acting, Biased Neutral, High Volt Front and Back

RELAY PART NUMBER. 99260400 DRAWING NUMBER. 5C643 REV. P COIL INDEX H-

QTY. AND TYPE OF CONTACTS: 6FB Front & Back(Silver Graphite to Silver) (HV)

RELAY COIL RESISTANCE. 500 OHMS, 130 WIRE SIZE, 13,000 TURNS.

PLUG COUPLER PART NO. REAR SERVICE 74655002 SHELF MOUNT _____
 FRONT SERVICE _____ TRAIN CARRIED _____

CONTACT DATA

APPLICATION (S) SAFETY. (HD) HEAVY DUTY. (HV) HIGH VOLTAGE. SAFETY

MAX. RATING VOLTS. UP TO 30 UP TO 30 UP TO 30

MAX. RATING AMPS. 4 10 25

OPERATING CHARACTERISTICS.

CONTACTS ARRANGEMENT AS VIEWED FROM REAR

OPERATING PARAMETERS	NORMAL <u>12.0</u> V DC _____ AMPS			LEFT SIDE <u>500</u>  RIGHT SIDE
	MIN. <u>6.50</u> V DC _____ AMPS			10 (-)COIL  (+)
	MAX. <u>120</u> V DC _____ AMPS	INTERMITTENT	6F(HV-S)	5F(HV-S)
OPERATING TIME AT NORMAL VOLTAGE. <input checked="" type="checkbox"/> AMPS, <input type="checkbox"/>	PICK-UP <u>0.25</u> SECOND		6H	5H
	RELEASE <u>0.02</u> SECOND		6(HV-S)	5B(HV-S)
FACTORY STANDARD CALIBRATION VALUE.	DROP-AWAY. <u>2.0</u> V. DC _____ AMPS		4F(HV-S)	3F(HV-S)
	PICK-UP <u>6.50</u> V. DC _____ AMPS		4H	3H
	WORKING <u>6.50</u> V. DC _____ AMPS		4AB(HV-S)	3B(HV-S)
INSERVICE APPLICATION LIMITS.	PICK-UP MAX. <u>7.15</u> V. DC <u>.0143</u> AMPS		2E(HV-S)	1F(HV-S)
	DROP-AWAY MIN. <u>1.34</u> V. DC <u>.0026</u> AMPS		2H	1H
OPERATING TEMPERATURE RANGE.	<u>-40° F</u> TO <u>+185° F</u> .			1 2B(HV-S)
				1B(HV-S)

NOTES

1. THIS RELAY SHALL BE TESTED ON A PERIODIC BASIS, NOT EXCEEDING 2 YEARS OR CURRENT FRA-REQUIREMENT TESTING INTERVAL.
2. WHEN RELAY OPERATE OUT SIDE THE INSERVICE APPLICATION LIMITS VALUE, IT SHALL BE RECONDITIONED AS PER PD-1 RELAY SHOPPING PROCEDURE AND CALIBRATE TO FACTORY STANDARD CALIBRATION VALUE.
3. CONTACT AMPERE RATING IS BASED ON RESISTIVE LOADS ONLY, DERATE 60% FOR INDUCTIVE AND 40% FOR MOTOR LOAD.

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Slow Release Biased Neutral High Voltage

RELAY PART NUMBER. 99260501 DRAWING NUMBER 5C659 REV-F INDEX CODE B-5

QTY. AND TYPE OF CONTACTS: 6FB F(AG Graphite to Silver) B(AG to AG Graphite)

RELAY COIL RESISTANCE. 200 OHMS, #29 WIRE SIZE, 6,500 TURNS.

REAR SERVICE 74655156 SHELF MOUNT _____
PLUG COUPLER PART NO. FRONT SERVICE _____ TRAIN CARRIED _____

CONTACT DATA

APPLICATION	<input type="checkbox"/> (S) SAFETY.	<input type="checkbox"/> (HD) HEAVY DUTY.	<input checked="" type="checkbox"/> (HV) HIGH VOLTAGE.
MAX. RATING VOLTS.	UP TO 30	UP TO 30	50VDC/110V AC 15A
MAX. RATING AMPS.	4	10	

OPERATING CHARACTERISTICS.

OPERATING PARAMETERS				CONTACTS ARRANGEMENT AS VIEWED FROM REAR		
				LEFT SIDE 200 Ohm RIGHT SIDE		
OPERATING TIME AT NORMAL VOLTAGE	<input type="checkbox"/>	<input checked="" type="checkbox"/> PICK-UP <u>0.50</u> SECOND		10	<u>(-)COIL</u>	<u>(+)COIL</u>
AMPS.	<input type="checkbox"/>	<input checked="" type="checkbox"/> RELEASE <u>1.6</u> SECOND		8	<u>6H</u>	<u>5H</u>
FACTORY STANDARD CALIBRATION VALUE		<input checked="" type="checkbox"/> DROP-AWAY	<u>2.0</u> VDC	6	<u>4F HV-S</u>	<u>3F HV-S</u>
INSERVICE APPLICATION LIMITS.		<input checked="" type="checkbox"/> PICK-UP	<u>6.5</u> VDC	5	<u>4H</u>	<u>3H</u>
		<input checked="" type="checkbox"/> WORKING	<u>6.5</u> VDC	4	<u>4B HV-S</u>	<u>3B HV-S</u>
OPERATING TEMPERATURE RANGE.		<input checked="" type="checkbox"/> PICK-UP MAX.	<u>7.15</u> VDC <u>0.035</u> AMPS	3	<u>3F HV-S</u>	<u>1F HV-S</u>
		<input checked="" type="checkbox"/> DROP-AWAY MIN.	<u>1.34</u> VDC <u>0.0067</u> AMPS	2	<u>2H</u>	<u>1H</u>
				1	<u>2B HV-S</u>	<u>1B HV-S</u>

NOTES

1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval.
2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factory standard calibration value.
3. Plug coupler part # 74655156 has built-in capacitor 4100 MFD 50V in series with 1 ohm, 5W resistor, to give a minimum total delay drop of 3.0 sec.

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Slow Release Biased Neutral High Voltage

RELAY PART NUMBER. 99260502 DRAWING NUMBER _____ INDEX CODE C-5

QTY. AND TYPE OF CONTACTS: 6FB F(Silver to Silver) HD

RELAY COIL RESISTANCE. 200 OHMS, #29 WIRE SIZE, 6,500 TURNS.

PLUG COUPLER PART NO. REAR SERVICE _____ SHELF MOUNT _____
 FRONT SERVICE _____ TRAIN CARRIED _____

CONTACT DATA

APPLICATION	FRONT CONTACTS	FRONT CONTACTS (HV-S)
<input type="checkbox"/> (S) SAFETY.	<input checked="" type="checkbox"/> (HD) HEAVY DUTY.	<input type="checkbox"/> (HV) HIGH VOLTAGE.
MAX. RATING VOLTS.	UP TO 30	50VDC/110V AC 15A
MAX. RATING AMPS.	4	10

OPERATING CHARACTERISTICS.

CONTACTS ARRANGEMENT _____
 AS VIEWED FROM REAR
 LEFT SIDE 200 Ohm RIGHT SIDE

OPERATING PARAMETERS	NORMAL <u>12</u> VDC _____ AMPS			10	(-) COIL  (+) COIL		
	MIN. <u>6.5</u> VDC _____ AMPS						
	MAX. <u>12.0</u> VDC _____ AMPS INTERMITTENT						
OPERATING TIME AT NORMAL VOLTAGE [] AMPS. []	PICK-UP <u>0.50</u> SECOND			8	<u>6H</u> <u>5H</u>		
	RELEASE <u>1.6</u> SECOND			7	<u>6B HD</u> <u>5B HD</u>		
FACTORY STANDARD CALIBRATION VALUE	DROP-AWAY <u>2.0</u> VDC _____ AMPS			6	<u>4F HD</u> <u>3F HD</u>		
	PICK-UP <u>6.5</u> VDC _____ AMPS			5	<u>4H</u> <u>3H</u>		
	WORKING <u>6.5</u> VDC _____ AMPS			4	<u>4B HD</u> <u>3B HD</u>		
INSERVICE APPLICATION LIMITS.	PICK-UP MAX. <u>7.15</u> VDC <u>0.035</u> AMPS			3	<u>3F HD</u> <u>1F HD</u>		
	DROP-AWAY MIN. <u>1.34</u> VDC <u>0.0067</u> AMPS			2	<u>2H</u> <u>1H</u>		
OPERATING TEMPERATURE RANGE.	-40°F to +185°F.			1	<u>2B HD</u> <u>1B HD</u>		

NOTES

1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval.
2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factory standard calibration value.
3. Plug coupler part # 74655156 has built-in capacitor 4100 MFD 50V in series with 1 ohm, 5W resistor, to give a minimum total delay drop of 3.0 sec.

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Overload

RELAY PART NUMBER. 99275015 DRAWING NUMBER 5C613 REV-B INDEX C-F

QTY. AND TYPE OF CONTACTS: 1H-1B, 1HFB Make Before Break, F & B (Palladium-Silver Non-Vital)

RELAY COIL RESISTANCE. 25/200

OVERLOAD/STICK

REAR SERVICE _____ SHELF MOUNT _____
PLUG COUPLER PART NO. FRONT SERVICE 74675244 TRAIN CARRIED _____

CONTACT DATA

APPLICATION	<input type="checkbox"/> (S) SAFETY.	<input type="checkbox"/> (HD) HEAVY DUTY.	<input checked="" type="checkbox"/> (X)
MAX. RATING VOLTS.	UP TO 30	UP TO 30	150 WATT (3A MAX.)
MAX. RATING AMPS.	4	10	

OPERATING CHARACTERISTICS.

WITHOUT 0.046 OHM RES.

OPERATING PARAMETERS	NORMAL <u>12/12</u> VDC		AMPS	CONTACTS ARRANGEMENT AS VIEWED FROM REAR	
	MIN.	<u>3/8</u> VDC		LEFT SIDE	RIGHT SIDE
	MAX.	<u>120/120</u> VDC	AMPS INTERMITTENT	9 A+	<u>1H</u>
OPERATING TIME AT NORMAL VOLTAGE	7-10 SEC.	WITH 0.046 OHM RESISTOR		8 A-	<u>1B</u>
AMPS. <input checked="" type="checkbox"/> 12 AMPS		AT		7 B+	<u>2H</u>
FACTORY STANDARD CALIBRATION VALUE	DROP-AWAY	<u>0.1/0.2</u> VDC	AMPS	6 B-	
	PICK-UP	<u>3/8</u> VDC	AMPS	5	
	WORKING	<u>3/8</u> VDC	AMPS	4	
INSERVICE APPLICATION	PICK-UP MAX.	<u>3.3/8/8</u> VDC	<u>.132/.044</u> AMPS	3	
LIMITS.	DROP-AWAY MIN.	<u>.067/.134</u> VDC	<u>.002/.0007</u> AMPS	2	
OPERATING TEMPERATURE RANGE.	<u>-40°F to +185°F.</u>		1		

NOTES

1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval.
2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factor standard calibration value.
3. Contact ampere rating is based on resistive loads only, derate 60% for inductive and 40% for motor load.

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Flasher Biased Neutral W/Heavy Duty Front & Back

RELAY PART NUMBER. 99275037 DRAWING NUMBER 5C515

QTY. AND TYPE OF CONTACTS: 4FB F&B, (Silver to Silver)

RELAY COIL RESISTANCE. 125 OHMS, #27 WIRE SIZE, 6,700 TURNS.

PLUG COUPLER PART NO. REAR SERVICE 74655026 SHELF MOUNT _____

FRONT SERVICE _____ TRAIN CARRIED _____

CONTACT DATA

APPLICATION	<input type="checkbox"/> (S) SAFETY.	<input checked="" type="checkbox"/> (HD) HEAVY DUTY.	<input type="checkbox"/> HV HIGH VOLTAGE.
MAX. RATING VOLTS.	UP TO 30	UP TO 30	
MAX. RATING AMPS.	4	10	

OPERATING CHARACTERISTICS.

CONTACTS ARRANGEMENT
AS VIEWED FROM REAR
LEFT SIDE 125 Ohm RIGHT SIDE

OPERATING PARAMETERS	<u>NORMAL 12.0</u> VDC	AMPS		
	<u>MIN. 3.0</u> VDC	AMPS	10 (-)COIL	(+)COIL

MAX. 120 VDC AMPS INTERMITTENT

10 (-)COIL (+)COIL

OPERATING TIME AT NORMAL VOLTAGE <input checked="" type="checkbox"/>	<u>PICK-UP 0.07</u> SECOND	8	_____
	<u>RELEASE 0.04</u> SECOND	7	_____

FACTORY STANDARD CALIBRATION VALUE	<u>DROP-AWAY 1.0</u>	VDC	AMPS	<u>6 4F(HD)</u>	<u>3F(HD)</u>
	<u>PICK-UP 3.0</u>	VDC	AMPS	<u>5 4H</u>	<u>3H</u>
	<u>WORKING 3.0</u>	VDC	AMPS	<u>4 4FB(HD)</u>	<u>3B(HD)</u>

INSERVICE APPLICATION LIMITS.	<u>PICK-UP MAX. 3.30</u>	VDC <u>0.264</u>	AMPS	<u>3 2F(HD)</u>	<u>1F(HD)</u>
	<u>DROP-AWAY MIN. 0.67</u>	VDC <u>0.0053</u>	AMPS	<u>2 2H</u>	<u>1H</u>

OPERATING TEMPERATURE RANGE. -40°F to +185°F. 1 2B(HD) 1B(HD)

NOTES

1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval.
2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factory standard calibration value.
3. Contact ampere rating is based on resistive loads only, derate 60% for inductive and 40% for motor load.
4. When this relay is used with Transcontrol Relay Driver Style (F.R.D.D) Part Number 75335009, it will provide 43 ± 2 Flashes per minute, starting at 10 VDC.

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Light Out, Biased Neutral Low Volt.

RELAY PART NUMBER. 99275048 DRAWING NUMBER 5C517 COIL INDEX F-H

QTY. AND TYPE OF CONTACTS: 4FB F(Silver Carbon to Silver)B(Silver to Silver)

A-Coil .15 A-Coil #14 A-Coil 180

RELAY COIL RESISTANCE. B-Coil- 350 OHMS, B-Coil #27 WIRE SIZE, B-Coil 5500 TURNS.

REAR SERVICE 74655037 SHELF MOUNT _____

PLUG COUPLER PART NO. _____

FRONT SERVICE _____ TRAIN CARRIED _____

CONTACT DATA

APPLICATION	<input checked="" type="checkbox"/> (S) SAFETY.	<input type="checkbox"/> (HD) HEAVY DUTY.	<input type="checkbox"/> HV HIGH VOLTAGE.
MAX. RATING VOLTS.	UP TO 30	UP TO 30	
MAX. RATING AMPS.	4	10	

OPERATING CHARACTERISTICS.

	B	A	CONTACTS ARRANGEMENT AS VIEWED FROM REAR
	NORMAL <u>12</u> VDC <u>1.80</u> AMPS		LEFT SIDE A-Coil RIGHT SIDE
OPERATING PARAMETERS	MIN. <u>8.25</u> VDC <u>0.80</u> AMPS		10 (-)COIL (+)COIL .15 Ohm
	MAX. <u>120</u> VDC <u>2</u> AMPS INTERMITTENT		9 + B-Coil 350 Ohm
OPERATING TIME AT	<u>.57</u> <u>.25</u> SECOND		8 -
NORMAL VOLTAGE (X)	B	A	
AMPS. (X) RELEASE	<u>.020</u> <u>.025</u> SECOND		7
	B-Coil	A-Coil	
	DROP-AWAY <u>3.25</u>	VDC <u>0.300</u> AMPS	6 4F 3F S
FACTORY STANDARD CALIBRATION VALUE	PICK-UP <u>8.25</u>	VDC <u>0.800</u> AMPS	5 4H 3H
	WORKING <u>8.25</u>	VDC <u>0.800</u> AMPS	4 4B 3B
INSERVICE APPLICATION	PICK-UP MAX. <u>9.07</u>	VDC <u>0.880</u> AMPS	3 2F 1F S
LIMITS.	DROP-AWAY MIN. <u>2.17</u>	VDC <u>0.201</u> AMPS	2 2H 1H
OPERATING TEMPERATURE RANGE.	-40°F to +185°F.		1 2B 1B

NOTES

1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval.
2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factor standard calibration value.
3. Contact ampere rating is based on resistive loads only, derate 60% for inductive and 40% for motor load.

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Magnetic Stick, Biased Neutral, Low Volt

RELAY PART NUMBER. 99275070 DRAWING NUMBER SC521 REV-1 INDEX CODE A-L

QTY. AND TYPE OF CONTACTS: 4FB F&B (Carbon Silver to Silver)

RELAY COIL RESISTANCE. 3500/220 OHMS, #34/31 WIRE SIZE, 35,000/6,750 TURNS.

REAR SERVICE _____ SHELF MOUNT _____
PLUG COUPLER PART NO.

FRONT SERVICE _____ TRAIN CARRIED 74675299

CONTACT DATA

APPLICATION	<input checked="" type="checkbox"/> (S) SAFETY.	<input type="checkbox"/> (HD) HEAVY DUTY.	<input type="checkbox"/> (HV) HIGH VOLTAGE.
MAX. RATING VOLTS.	UP TO 30	UP TO 30	
MAX. RATING AMPS.	4	10	

OPERATING CHARACTERISTICS.

CONTACTS ARRANGEMENT
AS VIEWED FROM REAR
LEFT SIDE 3,500 Ohms RIGHT SIDE

OPERATING PARAMETERS	NORMAL	<u>28</u>	VDC	AMPS		
	MIN.	<u>15.8/5.75</u>	VDC	AMPS	10	(-)COIL  (+)COIL 220 Ohm
	MAX.	<u>280</u>	VDC	AMPS	9	(-)  (+)

OPERATING TIME AT NORMAL VOLTAGE <input checked="" type="checkbox"/>	PICK-UP	<u>0.10</u>	SECOND	8	_____
	AMPS. <input type="checkbox"/> RELEASE	<u>0.10</u>	SECOND	7	_____

FACTORY STANDARD CALIBRATION VALUE	NORMAL	<u>15.8/5.75</u>	VDC	AMPS	6	<u>4F(S)</u>	<u>3F(S)</u>
	REVERSE	<u>15.8/5.75</u>	VDC	AMPS	5	<u>4H</u>	<u>3H</u>

INSERVICE APPLICATION LIMITS.	NORMAL	<u>17.38/6.32</u>	VDC	<u>.005/.287</u> AMPS	3	<u>2F(S)</u>	<u>1F(S)</u>
	REVERSE	<u>17.38/6.32</u>	VDC	<u>.005/.0287</u> AMP	2	<u>2H</u>	<u>1H</u>

OPERATING TEMPERATURE RANGE. -40°F to +185°F. 1 2B(S) 1B(S)

NOTES

1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval.
2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factory standard calibration value.
3. Contact ampere rating is based on resistive loads only, derate 60% for inductive and 40% for motor load.

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Magnetic Stick. Biased. Neutral. Low Volt

RELAY PART NUMBER. 99275180 DRAWING NUMBER. SCS38 REV. C COIL INDEX B-J

QTY. AND TYPE OF CONTACTS: 4N-4R F&B(Carbon Silver to Silver)

RELAY COIL RESISTANCE. 125 OHMS, #27 WIRE SIZE, 6,700 TURNS.

PLUG COUPLER PART NO. REAR SERVICE 74655002 SHELF MOUNT _____
 FRONT SERVICE _____ TRAIN CARRIED _____

CONTACT DATA

APPLICATION (S) SAFETY. (HD) HEAVY DUTY. (HV) HIGH VOLTAGE

MAX. RATING VOLTS. UP TO 30 UP TO 30

MAX. RATING AMPS. 4 10

OPERATING CHARACTERISTICS.

CONTACTS ARRANGEMENT AS VIEWED FROM REAR

OPERATING PARAMETERS	NORMAL <u>12.0</u> V DC _____ AMPS			LEFT SIDE 10 (-)COIL /25Ω	RIGHT SIDE (+)COIL		
	MIN. <u>5.0</u> V DC _____ AMPS						
	MAX. <u>120</u> V DC _____ AMPS INTERMITTENT. 8 _____						
OPERATING TIME AT NORMAL VOLTAGE AMPS. <input checked="" type="checkbox"/>	PICK-UP <u>0.10</u> SECOND			8 _____	-----		
	RELEASE <u>0.10</u> SECOND			7 _____	-----		
FACTORY STANDARD CALIBRATION VALUE.	Normal Working <u>5.0</u> V. DC _____ AMPS			6 <u>4F</u> (S)	<u>3F</u> (S)		
	Reverse Working <u>5.0</u> V. DC _____ AMPS			5 <u>4H</u> _____	<u>3H</u> _____		
INSERVICE APPLICATION LIMITS.	PICK-UP MAX. <u>5.50</u> V. DC <u>0.044</u> AMPS			4 <u>4B</u> (S)	<u>3B</u> (S)		
	DROP-AWAY MIN. <u>5.50</u> V. DC <u>0.044</u> AMPS			3 <u>2F</u> (S)	<u>1F</u> (S)		
OPERATING TEMPERATURE RANGE.		-40° F TO +185° F.			2 <u>2H</u> _____ 1 <u>2B</u> (S)		
					----- -----		

NOTES

1. THIS RELAY SHALL BE TESTED ON A PERIODIC BASIS, NOT EXCEEDING 2 YEARS OR CURRENT FRA-REQUIRED TESTING INTERVAL.
2. WHEN RELAY OPERATE OUT SIDE THE INSERVICE APPLICATION LIMITS VALUE, IT SHALL BE RECONDITIONED AS PER PD-1 RELAY SHOPPING PROCEDURE AND CALIBRATE TO FACTORY STANDARD CALIBRATION VALUE.
3. CONTACT AMPERE RATING IS BASED ON RESISTIVE LOADS ONLY, DERATE 60% FOR INDUCTIVE AND 40% FOR MOTOR LOAD.

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Power off, Biased Neutral

RELAY PART NUMBER. 99275257 DRAWING NUMBER 5C564

QTY. AND TYPE OF CONTACTS: 4FB F&B/Carbon Silver to Silver B HD (Silver to Silver)

RELAY COIL RESISTANCE. 125 OHMS, #27 WIRE SIZE, 6,700 TURNS.

REAR SERVICE 74655048 SHELF MOUNT _____
PLUG COUPLER PART NO. FRONT SERVICE _____ TRAIN CARRIED 74675299

CONTACT DATA

APPLICATION	<input checked="" type="checkbox"/> (S) SAFETY.	<input type="checkbox"/> (HD) HEAVY DUTY.	<input type="checkbox"/> (HV) HIGH VOLTAGE.
MAX. RATING VOLTS.	UP TO 30	UP TO 30	
MAX. RATING AMPS.	4	10	

OPERATING CHARACTERISTICS.

CONTACTS ARRANGEMENT
AS VIEWED FROM REAR

OPERATING PARAMETERS	NORMAL <u>12.0</u> VDC <u> </u> AMPS			LEFT SIDE 125 Ohm	RIGHT SIDE
	MIN.	<u>3.0</u> VDC	<u> </u> AMPS		
	MAX.	<u>120</u> VDC	<u> </u> AMPS INTERMITTENT		
OPERATING TIME AT NORMAL VOLTAGE <input checked="" type="checkbox"/>	PICK-UP <u>0.07</u> SECOND			8	
AMPS. <input type="checkbox"/> RELEASE <u>0.04</u> SECOND				7	
FACTORY STANDARD CALIBRATION VALUE	DROP-AWAY <u>1.0</u> VDC	<u> </u> AMPS	<u> </u> AMPS	<u>6 4F(S)</u>	<u>3F(S)</u>
	PICK-UP <u>3.0</u> VDC	<u> </u> AMPS	<u> </u> AMPS	<u>5 4H</u>	<u>3H</u>
	WORKING <u>3.0</u> VDC	<u> </u> AMPS	<u> </u> AMPS	<u>4 4B(H.D.)</u>	<u>3B(H.D.)</u>
INSERVICE APPLICATION LIMITS.	PICK-UP MAX. <u>3.30</u> VDC	<u>.264</u> AMPS		<u>3 1F(S)</u>	<u>1F(S)</u>
	DROP-AWAY MIN. <u>0.67</u> VDC	<u>.005</u> AMPS		<u>2 1H</u>	<u>1H</u>
OPERATING TEMPERATURE RANGE.	<u>-40°F</u> to <u>+185°F</u> .			<u>1 1B(H.D.)</u>	<u>1B(H.D.)</u>

NOTES

1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval.
2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factory standard calibration value.
3. Contact ampere rating is based on resistive loads only, derate 60% for inductive and 40% for motor load.
4. When P.O. Rectifier unit Part no. 78805088 is in circuit, min. drop-away value is 6.70V.AC. and max. pick-up & work at 9.0V.AC.
5. When this relay is used for other application, plug coupler P/N 74655002 shall be used.

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Magnetic Stick Low Volt

RELAY PART NUMBER. 99275334 DRAWING NUMBER SC573 REV.-E CODE INDEX C-K

QTY. AND TYPE OF CONTACTS: 4N,4R F&B(Carbon Silver to Silver)

RELAY COIL RESISTANCE. 500 OHMS, #30 WIRE SIZE, 13,000 TURNS.

PLUG COUPLER PART NO. REAR SERVICE 74655002CK SHELF MOUNT _____

FRONT SERVICE _____ TRAIN CARRIED _____

CONTACT DATA

APPLICATION (S) SAFETY. (HD) HEAVY DUTY. (HV) HIGH VOLTAGE.

MAX. RATING VOLTS. UP TO 30 UP TO 30

MAX. RATING AMPS. 4 10

OPERATING CHARACTERISTICS.

CONTACTS ARRANGEMENT

AS VIEWED FROM REAR

LEFT SIDE 500 Ohm RIGHT SIDE

OPERATING PARAMETERS NORMAL 12.0 VDC ____ AMPS
 MIN. 10.0 VDC ____ AMPS 10 (-)COIL (+)COIL
 MAX. 120 VDC ____ AMPS INTERMITTENT 9 _____ 2K, 2W

OPERATING TIME AT PICK-UP 0.10 SECOND 8 _____
 NORMAL VOLTAGE AMPS. RELEASE 0.10 SECOND 7 _____

FACTORY STANDARD CALIBRATION VALUE NORMAL WORKING 10.0 VDC ____ AMPS 6 4F(S) 3F(S)
 REVERSE WORKING 10.0 VDC ____ AMPS 5 4H 3H
 4 4B(S) 3B(S)

INSERVICE APPLICATION PICK-UP MAX. 11.0 VDC 0.022 AMPS 3 2F(S) 1F(S)
 LIMITS. DROP-AWAY MIN. 11.0 VDC 0.022 AMPS 2 2H 1H

OPERATING TEMPERATURE RANGE. -40°F to +185°F. 1 2B(S) 1B(S)

NOTES

1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval.
2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factory standard calibration value.
3. Contact ampere rating is based on resistive loads only, derate 60% for inductive and 40% for motor load.
4. All capacitors are based on 500 ohm coil.
5. 2K resistor is connected in parallel to coil.
6. F- NORMAL B-REVERSE

✓

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Overload

RELAY PART NUMBER. 99275607 **DRAWING NUMBER** SC640 REV-C **INDEX** C-F

QTY. AND TYPE OF CONTACTS: 1H-1B. 1HFB Make Before Break, F & B (Palladium-Silver Non-Vital)

RELAY COIL RESISTANCE. 25/200

OVERLOAD/STICK

REAR SERVICE 74655101 SHELF MOUNT _____

PLUG COUPLER PART NO.

FRONT SERVICE _____ TRAIN CARRIED _____

CONTACT DATA

APPLICATION	<input type="checkbox"/> (S) SAFETY.	<input type="checkbox"/> (HD) HEAVY DUTY.	<input checked="" type="checkbox"/>
MAX. RATING VOLTS.	UP TO 30	UP TO 30	150 WATT (3A MAX.)
MAX. RATING AMPS.	4	10	

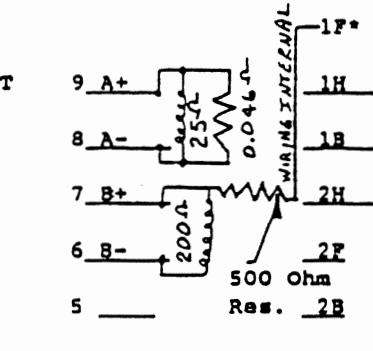
OPERATING CHARACTERISTICS.

WITHOUT 0.046 OHM RES.

OPERATING PARAMETERS	NORMAL <u>12/12</u> VDC _____ AMPS		LEFT SIDE	RIGHT SIDE
	MIN. <u>3/8</u> VDC _____ AMPS			
	MAX. <u>120/120</u> VDC _____ AMPS	INTERMITTENT		

OPERATING TIME AT 7-10 SEC. WITH 0.046 OHM RESISTOR
 NORMAL VOLTAGE AT
 AMPS. 12 AMPS

**CONTACTS ARRANGEMENT
AS VIEWED FROM REAR**



FACTORY STANDARD CALIBRATION VALUE	DROP-AWAY <u>0.1/0.2</u> VDC _____ AMPS	6 B-	2F
	PICK-UP <u>3/8</u> VDC _____ AMPS	5	Res. 2B
	WORKING <u>3/8</u> VDC _____ AMPS	4	_____

INSERVICE APPLICATION	PICK-UP MAX. <u>3.3/8.8</u> VDC <u>.132/.044</u> AMPS	3	_____
	DROP-AWAY MIN. <u>.067/.134</u> VDC <u>.002/.0007</u> AMPS	2	_____

OPERATING TEMPERATURE RANGE. -40°F to +185°F. **1** _____

NOTES

1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval.
2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factory standard calibration value.
3. Contact ampere rating is based on resistive loads only, derate 60% for inductive and 40% for motor load.
4. *1F contact is internally wired and this tab is not brought out on the plug coupler.

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Light Out Biased Neutral Low Voltage

RELAY PART NUMBER. 99275838 DRAWING NUMBER 5C642 Rev. B COIL INDEX B-C

QTY. AND TYPE OF CONTACTS: 4FB F/Silver Carbon to Silver) B (Silver to Silver)
A-Coil .37 A-Coil #14 A-Coil 480

RELAY COIL RESISTANCE. B-Coil .086 OHMS, B-Coil #14 WIRE SIZE, B-Coil 150 TURNS.

REAR SERVICE 74655134 SHELF MOUNT _____

PLUG COUPLER PART NO. _____

FRONT SERVICE _____ TRAIN CARRIED _____

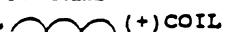
CONTACT DATA

APPLICATION	<input checked="" type="checkbox"/> (S) SAFETY.	<input type="checkbox"/> (HD) HEAVY DUTY.	<input type="checkbox"/> (HV) HIGH VOLTAGE.
MAX. RATING VOLTS.	UP TO 30	UP TO 30	
MAX. RATING AMPS.	4	10	

OPERATING CHARACTERISTICS. Coils A & B
 In Series

OPERATING PARAMETERS	NORMAL	VDC	AMPS
	MIN.	.300	AMPS
	MAX.	2.5A	AMPS

CONTACTS ARRANGEMENT
 AS VIEWED FROM REAR
 LEFT SIDE A-Coil RIGHT SIDE
 0.37 Ohms

10 (-)COIL  (+)COIL

OPERATING TIME AT PICK-UP 0.24 SECOND
 NORMAL VOLTAGE AMPS. RELEASE 0.2 SECOND

8 B-Coil 0.086 Ohms -

7 _____

FACTORY STANDARD
 CALIBRATION VALUE
 GRADUAL INCREASE &
 DECREASE OF INPUT DC

VOLTAGE

INSERVICE APPLICATION PICK-UP MAX. VDC .330 AMPS 3 2F(S) 1F(S)
 LIMITS.

DROP-AWAY MIN. VDC .100 AMPS 2 2H 1H

OPERATING TEMPERATURE RANGE. -40°F to +185°F.

1 2B 1B

NOTES

1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval.
2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factory standard calibration value.
3. See application circuit for light-out.

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Magnetic Blow-Out Biased Neutral

RELAY PART NUMBER. 99275860 DRAWING NUMBER 5C655 Rev-D INDEX CODE B-6

QTY. AND TYPE OF CONTACTS: 2F-2B F&B(Silver Graphite to Silver) (HV)

RELAY COIL RESISTANCE. 500 OHMS, #30 WIRE SIZE, 13.000 TURNS.

REAR SERVICE 7465511286 SHELF MOUNT _____
PLUG COUPLER PART NO. _____

FRONT SERVICE _____ TRAIN CARRIED _____

CONTACT DATA

APPLICATION	<input type="checkbox"/> (S) SAFETY.	<input checked="" type="checkbox"/> (HD) HEAVY DUTY.	<input checked="" type="checkbox"/> (HV) HIGH VOLTAGE.
MAX. RATING VOLTS.	UP TO 30		UP TO 130V
MAX. RATING AMPS.	15		25

(NOTE 3)

CONTACTS ARRANGEMENT
AS VIEWED FROM REAR

OPERATING PARAMETERS	NORMAL <u>12.0</u> VDC	AMPS	LEFT SIDE	500 Ohm	RIGHT SIDE
	MIN. <u>7.00</u> VDC	AMPS	10	(-)COIL	+(+)COIL
	MAX. <u>120</u> VDC	AMPS INTERMITTENT	9	1F (HV-S)	_____

OPERATING TIME AT NORMAL VOLTAGE <input checked="" type="checkbox"/>	PICK-UP <u>0.16</u> SECOND	8	1H	_____
AMPS. <input type="checkbox"/>	RELEASE <u>0.03</u> SECOND	7	_____	_____

FACTORY STANDARD CALIBRATION VALUE	DROP-AWAY <u>2.00</u> VDC	AMPS	6	_____	<u>3F(S)</u>
	PICK-UP <u>7.00</u> VDC	AMPS	5	4H	<u>3H</u>
	WORKING <u>7.00</u> VDC	AMPS	4	4B(HV-S)	<u>3B(H.D.)</u>

INSERVICE APPLICATION LIMITS.	PICK-UP MAX. <u>7.70</u> VDC <u>0.015</u> AMPS	3	2F(HV-S)	_____
	DROP-AWAY MIN. <u>1.34</u> VDC <u>0.002</u> AMPS	2	2H	+

OPERATING TEMPERATURE RANGE. -40°F to +185°F. 1 1B(H.D.) _____

NOTES

1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval.
2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factory standard calibration value.
3. In connection with arc quenching magnet, intermittent duty.
4. Application: Switch machine 110V DC load control.

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Slow Release Biased Neutral Low Voltage.

RELAY PART NUMBER. 99275882 DRAWING NUMBER SC557 REV-A INDEX B-2

QTY. AND TYPE OF CONTACTS: 6FB F(Carbon Silver to Silver) B(Silver to Silver)

RELAY COIL RESISTANCE. 200 OHMS, #29 WIRE SIZE, 6,500 TURNS.

REAR SERVICE 74655002 SHELF MOUNT _____
PLUG COUPLER PART NO. _____

FRONT SERVICE _____ TRAIN CARRIED _____
CONTACT DATA

APPLICATION	<input checked="" type="checkbox"/> (S) SAFETY.	<input type="checkbox"/> (HD) HEAVY DUTY.	<input type="checkbox"/> (HV) HIGH VOLTAGE.
MAX. RATING VOLTS.	UP TO 30	UP TO 30	
MAX. RATING AMPS.	4	10	

OPERATING CHARACTERISTICS.

CONTACTS ARRANGEMENT AS VIEWED FROM REAR			
OPERATING PARAMETERS	NORMAL <u>12.0</u> VDC	_____ AMPS	LEFT SIDE 200 Ohm RIGHT SIDE
	MIN. <u>6.5</u> VDC	_____ AMPS	10 (-) COIL  (+) COIL
	MAX. <u>120</u> VDC	_____ AMPS INTERMITTENT	9 <u>6F (S)</u> <u>5F (S)</u> 1K, 2W
OPERATING TIME AT NORMAL VOLTAGE <input checked="" type="checkbox"/>	PICK-UP <u>0.35</u> SECOND	8 <u>6H</u> <u>5H</u>	
AMPS. <input type="checkbox"/>	RELEASE <u>0.9</u> SECOND at 12V	7 <u>6B</u> <u>5B</u>	
FACTORY STANDARD CALIBRATION VALUE	DROP-AWAY <u>2.0</u> VDC	6 <u>4F (S)</u> <u>3F (S)</u>	
	PICK-UP <u>6.5</u> VDC	5 <u>4H</u> <u>3H</u>	
	WORKING <u>6.5</u> VDC	4 <u>4B</u> <u>3B</u>	
INSERVICE APPLICATION LIMITS.	PICK-UP MAX. <u>7.15</u> VDC <u>0.036</u> AMPS	3 <u>2F (S)</u> <u>1F (S)</u>	
	DROP-AWAY MIN. <u>1.34</u> VDC <u>0.067</u> AMPS	2 <u>2H</u> <u>1H</u>	
OPERATING TEMPERATURE RANGE.	-40°F to +185°F.	1 <u>2B</u> <u>1B</u>	

NOTES

1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval.
2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factory standard calibration value.
3. Contact ampere rating is based on resistive loads only, derate 60% for inductive and 40% for motor load.
4. All calculations are based on 200 ohm coil.
5. 1K resistor is connected in parallel to coil.

RELAY ENGINEERING APPLICATION INFORMATION SHEET

THIS SHEET PROVIDES GENERAL INFORMATION CONCERNING THE CONTACTS, COIL AND OPERATING CHARACTERISTICS FOR THIS RELAY.

TYPE OF RELAY. PD-1 Ord. Acting Biased Neutral Low Voltage.

RELAY PART NUMBER. 99275893 DRAWING NUMBER 5C658 REV-A INDEX B-3

QTY. AND TYPE OF CONTACTS: 6FB F(Carbon Silver to Silver) B(Silver to Silver)

RELAY COIL RESISTANCE. 500 OHMS, #30 WIRE SIZE, 13,000 TURNS.

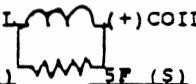
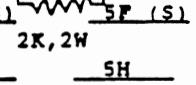
REAR SERVICE 74655002 SHELF MOUNT _____
PLUG COUPLER PART NO. _____

FRONT SERVICE _____ TRAIN CARRIED _____

CONTACT DATA

APPLICATION	<input checked="" type="checkbox"/> (S) SAFETY.	<input type="checkbox"/> (HD) HEAVY DUTY.	<input type="checkbox"/> (HV) HIGH VOLTAGE.
MAX. RATING VOLTS.	UP TO 30	UP TO 30	
MAX. RATING AMPS.	4	10	

OPERATING CHARACTERISTICS.

CONTACTS ARRANGEMENT AS VIEWED FROM REAR			
OPERATING PARAMETERS	NORMAL <u>12.0</u> VDC	_____ AMPS	LEFT SIDE 500 Ohm RIGHT SIDE
	MIN. <u>6.5</u> VDC	_____ AMPS	10 (-)COIL  (+)COIL
	MAX. <u>120</u> VDC	_____ AMPS	9 6F (S)  5F (S)
OPERATING TIME AT NORMAL VOLTAGE <input checked="" type="checkbox"/>	PICK-UP <u>0.25</u> SECOND	_____	2K, 2W
AMPS. <input type="checkbox"/>	RELEASE <u>0.02</u> SECOND at 12V	_____	8 6H _____ 5H
FACTORY STANDARD CALIBRATION VALUE	DROP-AWAY <u>2.0</u> VDC	_____ AMPS	7 6B _____ 5B
	PICK-UP <u>6.5</u> VDC	_____ AMPS	6 4F (S) _____ 3F (S)
	WORKING <u>6.5</u> VDC	_____ AMPS	5 4H _____ 3H
INSERVICE APPLICATION LIMITS.	PICK-UP MAX. <u>7.15</u> VDC	<u>.0143</u> AMPS	4 4B _____ 3B
	DROP-AWAY MIN. <u>1.34</u> VDC	<u>.0027</u> AMPS	3 2F (S) _____ 1F (S)
OPERATING TEMPERATURE RANGE.	-40°F to +185°F.		2 2H _____ 1H
NOTES	1. This relay shall be tested on a periodic basis, not exceeding 2 years or current FRA-required testing interval. 2. When relay operate out side the inservice application limits value, it shall be reconditioned as per PD-1 relay shopping procedure and calibrate to factory standard calibration value. 3. Contact ampere rating is based on resistive loads only, derate 60% for inductive and 40% for motor load. 4. All calculations are based on 500 Ohm coil. 5. 2K resistor is connected in parallel to coil.		1 2B _____ 1B